RAILROAD GAZETTE

SATURDAY, APRIL 20, 1872.

LOCOMOTIVE VALVE GEAR:

*An Investigation relating to the Operation of Steam Engine Slide Valves.**

BY MR. SAMUEL HANNAH.

In the early application of steam to the production of motion, regard was paid, not so much to the most economical method of using the power, or expansive force of the steam, as to its production of motion in any shape, and its direction on such materials as it could be most easily brought to bear upon. Thus in Captain Savery's engine the water usually required to be elevated from the pits was acted upon directly by the steam, at a great sacrifice of heat. As knowledge advanced, however, steam was used in giving motion to a piston by its expansion, a vacuum being formed on the opposite side at the same time. This side of the piston having no communication with the outer atmosphere was relieved of its pressure, and thus caused a relative addition to the force or expansion of the steam on the opposite side.

As the laws of heat became better known, and more suitable materials were found for the construction of the steam engine, the economy of using higher pressures became evident. It also appeared that the higher the pressure of steam used, the less was the comparative saving effected by using a condenser. So in the locomotive and in many stationary engines the condensing apparatus has been entirely dispensed with.

Attention was then directed to what might be termed the "more equal distribution of forces, and changes toward the production of a uniform motion," and so it became necessary to examine minutely the motion of the valve, and to observe if the distribution of the steam, effected thereby, was suitable for the attainment of this object. In some engines this is not the case, as exemplified in the accompanying fig. 2, which shows the relative propulsive pressures on the crank pins of a double cylindered condensing engine.

The lines radiating from the center represent equal divisions of the motion of the crank pin. The horizontal lines within the smaller circle show, proportionally, the effective leverage of the steam pressure on the crank pin at different points of the stroke; the value of which is given in numbers on each, the radius being 100.

FIG. 1.

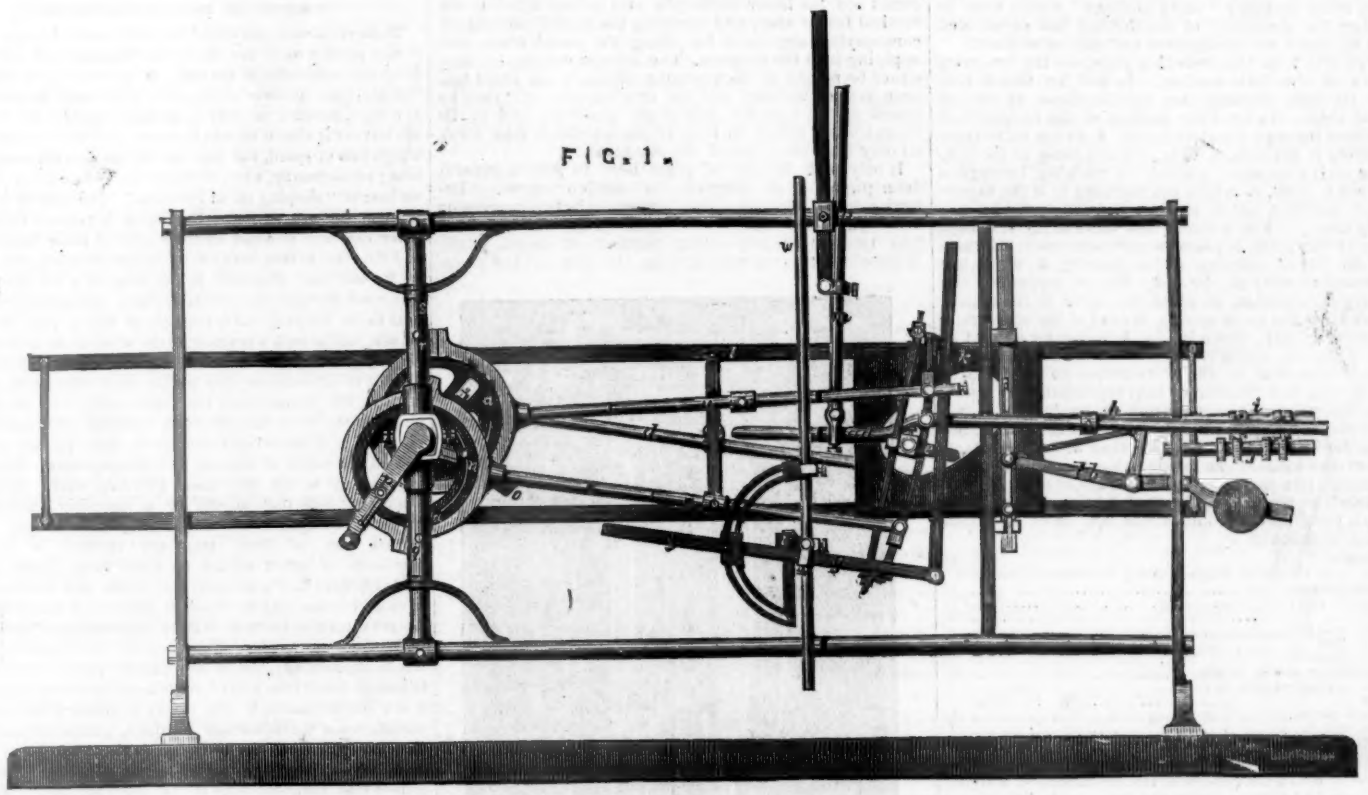


FIG. 2.

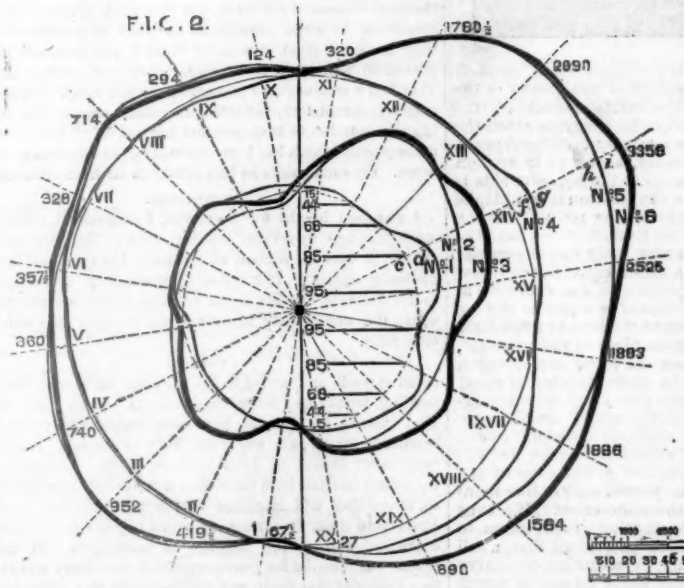


FIG. 3.

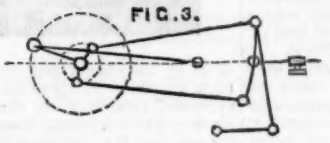


FIG. 4.

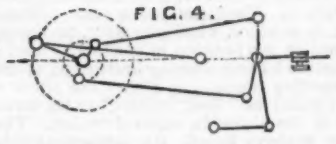


FIG. 5

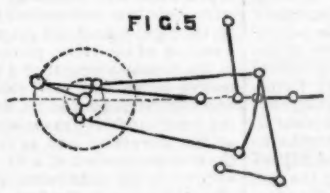


FIG. 6.

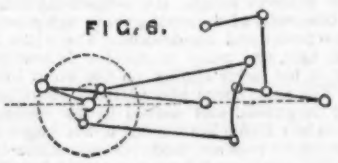


FIG. 7.

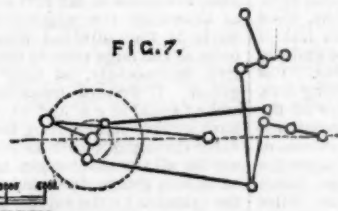
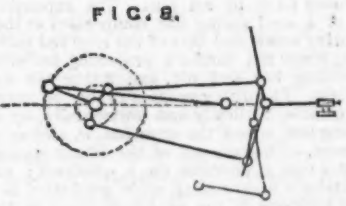


FIG. 8.



The lengths, *c* to *d*, etc., represent the actual pressures at the position XIV., etc., of the crank pin, measured by the scale for pressure curves, Nos. 1, 2, 3, and are derived from indicator diagrams. By tracing the curve, No. 1, through the terminating points of these pressure ordinates, the pressure on the crank pin throughout the stroke will be represented, In the same manner No. 2 curve is formed for the pressure on the crank pin of the adjoining coupled engine. No. 3 curve is formed by the addition of the pressure ordinates of curves Nos. 1 and 2, and would represent by its ordinates the total steam pressure from the combined engines.

The outer circle represents the neutral line of the propelling forces acting on the crank pin. The ordinate, *f g*, is the product of the leverage, 85, and the pressure ordinate, *c d*. In the same manner *f h* is the ordinate for No. 2 engine. The sum of these two, *f i*, is an ordinate, representing the actual pressure on the crank pin at that point, and is to be compared with the other ordinates, similarly formed at the other positions of the crank pin, through the terminating points of which the outer curve is traced. We thus see that at one position 1 of the crank pin the sum of the forward or propelling forces is actually less than that of the retarding, and, but for the momentum of the piston and parts in motion, and the fly-wheel, the tendency of the engine would be to go backward.

Again, looking on the opposite side of the diagram, an excess of propelling force is very evident, and, as all valve gears vary in the effects they produce on the motion of the slide valve, if the distribution were left to chance an engine would often be produced which would be far from being satisfactory in its action or economical in the use of fuel.

Some years ago the writer had much of his attention devoted personally to the examination of the valve distribution on the locomotives of the Stockton & Darlington Railway. The table, appended, gives the result of one such examination:

Six notches, of which Number 4 about mid-gear only is given.....	Lead.	Stroke of valve.....	Port opens.....	Steam cut off.....	Exhaust shuts.....	Exhaust opens.....	Opposite port opens...
		ENGINE FORWARD. FRONT STROKE.					
		in.	in.	in.	in.	in.	in.
4		1⅞	2½	¼	10½	16½	19	21½
		ENGINE FORWARD. BACK STROKE.					
4		1⅞	..	1⅞	12½	17½	19½	21½
		ENGINE BACKWARD. FRONT STROKE.					
4		1⅞	3½	¼	12½	18½	19½	21½
		ENGINE BACKWARD. BACK STROKE.					
4		1⅞	..	1	14½	18½	19½	21½

A templet corresponding in sectional shape to the valve

* Paper read before the Cleveland Institution of Engineers.

was affixed to the valve spindle. The motion of the valve could thus be easily examined. By means of a suitable templet, representing a section of the cylinder ports, the distribution of the steam and the distance traveled by the piston (for any admission, expansion, or exhaust, or other point to be considered) could be measured and tabulated, as given on the sheet. The costliness of this method, and the loss of time in ascertaining the effect of any modification of the valve gear, induced the writer to turn his attention toward a better means of obtaining the desired information. The result was the invention and construction of the machine that forms the subject of this paper.

There is a great variety of what are called "link motions"—that is, arrangements in which the motion of a pair of eccentrics is transmitted to the slide valve by means of a curved link; and hence the name, as distinguished from the many "valve motions" which were in use before the simplicity of the shifting link superseded almost all others for locomotives and marine engines.

In figs. 3 to 7, on the preceding page, are the five great varieties of the link motion. It will be found that nearly all link motions are modifications of one or other of these. In fig. 3 the motion of the eccentrics is transmitted through the slotted link, *b*, to the valve spindle moving in a guide, *d*. Fig. 4 is the same as the last, but the valve spindle, instead of working through a guide, has a joint, *d*, which has working in it the expansion link block, *e*, and is also carried through to a suspending link, *f*. Fig. 5 shows the same as fig. 3, except that the shifting link is placed somewhere about the middle of its length, differing so far from fig. 3, which has the connection only at the end. Fig. 6 represents the stationary link motion, in which the curve of the expansion link faces the valve spindle instead of the eccentrics. It is similar to that shown in fig. 4, in having a joint in the valve spindle, which is lifted or lowered to cause the necessary alteration in the distribution to take place. Fig. 7 shows a combination of that represented by fig. 6, the stationary link with the motion shown in fig. 3.

Fig. 8 shows a link motion suggested by the writer, depending for its action on the following well-known fact, viz.: that the locus of an angle, whose confining lines pass through two points, would be an arc of a circle.

The machine represented by fig. 1, having to be adapted to suit all the different modifications that have just been described, consists of

The eccentrics	*a*
The crank (not visible on diagram, being immediately behind the eccentrics)	*b.*
The eccentric rods	*c.*
The connecting rod	*d.*
The expansion link	*e.*
The lifting link	*f.*
The lifting spanner	*g.*
The slide spindle and its guides	*h.*
And its attached slide valve	*i*
The ports	*j.*
The diagram plate	*k.*
The pencil rod	*l.*
The suspending link	*m.*

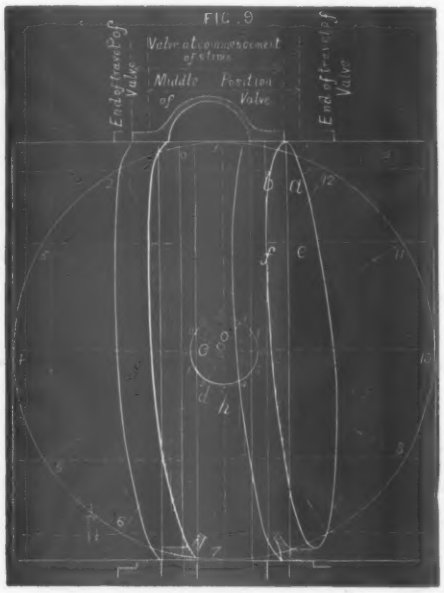
The travel or throw of the eccentrics is adjustable from a minimum of 0 to a maximum of 7in. by means of a tight-fitting block and screw adjustment and a scale division on the inner edge. The eccentrics are, after being adjusted, firmly attached to each other by a screw, *n*, working in a slotted link, *o*. The latter is also made adjustable round the axle, to produce, when necessary, an unequal lead of the eccentrics, and fastened in position by a set screw.

The handle having a spring knife-edge, *p*, entering into two projecting studs, *q*, *r*, places the crank exactly on what are called the "dead centers," or the termination of a stroke of the piston in either direction. The crank, *b*, is of one uniform length, the connecting-rod, *d*, being divided into units of the crank, these again being subdivided into tenths and hundredths. The whole is mounted on an axle, and made to revolve in bearings on the cross-bar, *s*, the latter sliding on the outer longitudinal frame. The outer frame also carries a secondary frame, *t*, sliding in guides, and moved by the connecting-rod. This secondary frame has fixed to it the diagram-plate, *k*.

The eccentric rods are made in adjustable lengths to insert in the machine, sliding past each other and adjusted by a scale on the edges. They are fixed by the box and set pin, *u*. The eccentric rod ends, or double eyes, work on blocks movable on the expansion links, these blocks being fixed by set pins. The expansion link is formed of a steel spring bar, compressed at the ends by an adjusting screw and nuts of the required radius. The adjusting screw rod carries a projecting and sliding arm, with a sliding box and pin, and fitting the eye of the lifting link. The lifting spanner center of suspension is also adjustable, vertically and horizontally, by means of the sliding box, *v*, and the cross bar, *w*, sliding upon the outer frame. The one end of the lifting spanner enters through a box, *y*, movable on a quadrant; this latter also contains a brass sliding scale graduated to give the different positions of the expansion block on the expansion link, and corresponding to the notches in the reversing rack of a locomotive. The other end of the spanner has an eye fitting a pin upon the lifting link, *f*. This latter has a box, and, fitting a loose pin, can be firmly fixed either to the top or the lower end of the expansion link, as may be required. Both lifting link and lifting spanner are graduated the full length, and the sliding box on each fixed by the set pins at the back. The valve spindle is made double, the back piece, sliding through guides fixed on the uprights, *x*, *z*, and carrying, at the outer end, sectional valve and ports, adjustable by their set pins. The other end has a bolt for firmly fixing the front part of the valve spindle, which, when not so fixed, may be made to vibrate on the sliding box, *a a*, the pin of which passes through the back spindle, and is firmly fixed thereto by a nut in one position. The front spindle also carries the expansion block, working upon the expansion link. First setting it back to clear the link, it is then carried forward, and has a sliding box for the purpose of being suspended; when no slide rod guides are used both ends of this spindle are graduated, and the two sliding boxes are fixed by set pins. The suspended link is graduated from end to end, and its lower end carries a pin, upon which the sliding box on the front valve spindle rides. On the body of the suspending link slides a box, fastened by a set pin, the eye of which is carried on a projecting and vertical sliding arm. At the place of crossing the outer frame another box is placed, sliding upon the top longitudinal bar of the outer frame. One set pin fixes the arm vertically, and at the same time its position on the longitudinal bar. The necessary scale dimensions for the position of this eye on the projecting arm, and also the center of suspension of the lifting link, are fixed by a separate graduated straight edge, having suitable appendages for readily determining the proper position of the centers.

We now come to the essential part of the machine, viz.: the special apparatus for the production of the diagram. On the back valve-spindle is fixed a pin, upon which a short connecting link vibrates, the other end of which is joined to the short end of a quadrant, *b b*. The longer arm has another link connected with the vertical pencil rod, the latter sliding in two guides fixed to the vertical frame stay, and carrying the pencil and its accompanying apparatus for lifting the pencil from, and applying it to the diagram. The balance weight, *c c*, may either be placed in its present position, as an exact balance to the quadrant and its attachments, or it may be placed on the opposite side of the quadrant, and by its weight being added to that of the quadrant, take away all play from the joints of the machine.

It may not be out of place here to give a general description of a diagram or motion curve. Referring to fig. 9, the outer circle represents the path of the crank-pin. It is divided into twelve, or any other number of equal parts. Without taking into consideration the effect of the angu-



larity of the connecting rod, the vertical lines through these divisions will give the position of the piston in the cylinder, relatively to the terminating points of the stroke. The horizontal lines across the diagram about the center show the widths of the steam and exhaust ports, with their bars or divisions between, as shown in section on the right side of the diagram. On the opposite side is a section of the valve, placed in the position it would take at the commencement of a stroke of the piston. As the motion curve may most easily be formed, if we take the valve arrangement to be driven by only one eccentric, the inner circle is drawn with a radius equal to the throw of the eccentric; and, as the position of the eccentric at the commencement of a stroke should be equal to the lap or cover of the slide valve, added to the lead or pre-admission, this gives us the first or center line of the eccentric, as shown by the number 1 on the inner circle, which circle is then divided into the same number of equal parts as the large one; so that the crank and eccentric arrive, successively, at their corresponding numbers together. If we now make the ordinate *a b* equal to *c d*, and *e f* equal to *g h*, and so on round the circle, we will have a curve representing the motion of one edge of the valve throughout a stroke of the piston, and in like manner for all the other edges of the slide valve. We thus have, at a glance, the whole distribution of the steam to the cylinder by the valve. It must be evident that, as all the curves are the same in form, by assuming one curve and making suitable lines for the ports, all can be represented that is done by the four. The motion of the valve, as shown, is only that of one eccentric. By taking such ordinates from the end of the valve spindle, the same results will be accomplished, with the addition, that it will represent correctly all the changes and modifications that occur from angularity of rods, two eccentrics and all other causes combined.

It will readily be perceived that, as the short arm of the machine quadrant has attached to it a link exactly half the long arm and its link, and as they are vibrating in exactly the same curves, but double the size, the motion of the vertical pencil rod will be an exact counterpart of the motion of the slide spindle. The pencil rod now in passing vertically over the diagram plate, which is actuated by the connecting rod, and has the exact motion of the piston given to it, produces a diagram in a few minutes, showing the entire action of the valve.

The machine, in its dimensions generally, is half size; that is, an eccentric rod 6ft. long on the engine would be represented by 3ft. on the machine, and the travel of the valve would be doubled by the bell crank, and thus be exactly full size. This arrangement can be modified to suit valve gears that are much out of the ordinary proportions.

It will also readily be seen that, if the proportion of the length of the connecting rod to the length of the crank be maintained, similar to the valve gear under investigation, all the advantages of a short and uniform diagram are secured.

Contributions.

NOTES ON THE MANAGEMENT OF AMERICAN RAILROADS.

BY A HINDOO.

[CONTINUED FROM PAGE 147.]

SLEEPING AND DRAWING-ROOM COACHES.

These are always marshaled at the tail end of trains, because in that position they are handy for shunting and are isolated from the remainder of the train so as to avoid thoroughfare. The position, however convenient, is the most dangerous one. If a train, running at only a moderate speed, leave the track, the last car is almost certain to upset; *a fortiori*, if traveling at a high rate of speed, the last car or two cars are certain to go over; consequently, every now and then, at no great intervals, we hear of "sleeping car in the ditch." The causes upsetting the end car are obvious. Oscillation is greatest there. The other cars are steadied by the weight of those behind them, and the road, having been cut up by the preceding cars, is worst for the last one. Moreover, in the event of a tail collision, the rear coach occupies an unenviable place. All things considered, next to the baggage car is perhaps as safe a place as can be chosen, and in such a position there need be no thoroughfare. No very great danger need be apprehended from butting collisions; of all accidents they are the most infrequent, and, let us hope, will become each year more rare; they ought to be placed in the list of impossibilities. Butting collisions are rare; rarer still is it that serious damage is done by such accidents beyond the wreck of engines and baggage-cars. Behind the baggage-car is not the place affording extra facility for shunting; but that should be a secondary consideration. As the occupants of the rolling palaces pay an enhanced rate of fare, they are entitled to as great a measure of safety as can be given them. Some persons may object to this reasoning, and argue that the passengers in these vehicles pay for the extra amount of luxury only, and are not otherwise entitled to more consideration than is given to the other passengers. Well, security of life and limb, I admit, is theoretically one of the natural rights of men; yet, failing to obtain it as a right, most men are willing to purchase it as a luxury, and so if this luxury be added to the æsthetical mitigations of travail already provided, gentlefolk patronizing these cars will receive a better value for their money and be proportionally eager to avail themselves of it. But if managers believe that sufficient value is now given and that more is unnecessary, I say, "Be it so! Then, on your own account, gentlemen, be careful. If you must upset a coach, let it be one of the least expensive you have, not the most costly! If you are bound to do some damage, do as little as possible!" There may be some good reason, of which I am ignorant, that has prevented managers from dealing with this matter hitherto. That it is a serious one I presume none will deny. The shunting excuse is insufficient, yet seeing no other I cannot help attributing the inaction to that general neglect of detail in railroad management which has been animadverted on already in these notes. On such points as this apathy is far from creditable.

DRAW-HEADS.

A standard height for these was, I understand, agreed upon some time ago by several leading roads. Now that the interchange of cars has become so extensive the standard should be generally adopted. It is not at all uncommon to see from four to five different heights in the same train, the inconvenience of which the unfortunate brakemen are the only ones who appreciate fully.

CORPSES

on most roads are carried in the baggage car among bundles of bedding, trunks and other impediments. Some lines, the New York Central, for instance, have each baggage car fitted with a receptacle for corpses under the body of the car. Such an arrangement should be adopted everywhere. Not infrequently the stench emitted from the coffins is powerfully nauseating, and, so, disgusting and injurious to the men who ride in the car. Apart from this, it cannot be right to place putrefaction and contagion among the luggage of passengers. In India no corpse was received for transportation unless there was satisfactory evidence that death was not the result of a contagious disease, and in all cases the body was carried in a horse box or other vehicle entirely separate from luggage and freight. In this country it would perhaps be too much to expect a doctor's certificate to accompany each relic, however desirable such a sanitary precaution might be. Nevertheless this is a matter demanding attention from managers, and, may be, it requires legislation.

THROUGH TRAINS.

Through trains are advertised to run over several connecting roads between large cities. For example: "The Great Central Route" from New York to Chicago over the Hudson River, New York Central, Great Western of Canada and Michigan Central railroads. This route runs four express trains daily. As a rule, if a train is not very much behind time the connecting road delays its train to make the connection. If more than an hour late the passengers miss connection and are compelled to loiter about a terminus in a state of dissatisfaction, and then take the first train, which may be slower than the one they intended to catch. This arrangement does not work satisfactorily. Over such a distance it must be expected that frequently a train on one road or the other will be off time. Either the through passengers miss connection, or the local ones are in-

convenienced by the irregularity. A better plan would be to run one (or more if necessary) fast through train and advertise it accordingly, making it connect regularly throughout the distance, no matter how late it might be on either road, and starting all other trains as locals, not allowing them to be detained for connecting road more than ten minutes. If this arrangement were properly advertised travelers would be able to regulate themselves accordingly. Without such an arrangement what is the use of advertising a "through route"? Passengers taking the "through route" on faith of the public notices, then finding themselves delayed at a terminus because they have missed connection, are apt to be, and are justified in being, rather hard on the management and skeptical as to the promises blazoned forth in letters of resplendent hue. When, as perhaps may be after having waited a weary time, he finds himself on a train that stops at every station, he may well feel inclined to curse his fate and resolve inwardly that his next journey shall test the facilities offered by the rival route. To be behind time is provoking enough, yet in a long journey a traveler does not object much to an hour or so. It is the hanging about stations, the standing still, the curbing of that impatient desire to move on faster and faster, that disgusts and sickens. I doubt if many railroad men appreciate fully the misery of a belated wayfarer. The railroader can procure a comfortable seat, ofttimes a couch, and a chat in some office; or, obtaining reliable information as to the time the train may be expected, saunter off to some place of amusement. The weary, friendless traveler dare not leave the station for a minute, fearing that his train may come and go during his absence, and so a greater misery await him; he has no resting-place but a hard, stiff-backed board seat in the comfortless waiting-room, usually a very "abomination of desolation," slippery with spittle, reeking with fumes of the vilest weed, resounding with profanation and obscenity. The sacrificing of local to the convenience of through passengers is neither necessary, politic nor just, yet a very common occurrence. Of course the idea is that local passengers have no choice and must put up with the best they can get, whereas through passengers must be enticed. On a few roads "behind time waiting for connections" is a chronic state. At some stations a notice is chalked up showing whether the train is on time or late, and if the latter, how much late. Why the plan is not put in operation at all stations on all roads is hard to be understood, yet I know that at some places such a practice is positively forbidden. While on this subject I may as well remark that nearly all waiting-rooms, except those at first-class stations, are used by loafers and men in the company's employ. A notice posted in each room forbids the use of it to all except travelers; but as there is no one to see that the rules are obeyed, these notices are dead letters. The most objectionable occupants are almost invariably the company's own employees, who imagine themselves privileged to do and say just as they "darned please" "in the premises." The ventilation of these dens appears to be a matter beneath the notice of architects and engineers. On a cold day, with the large stove choke full of wood, the doors all closed, and a goodly company smoking some infernal composition, pity the sorrows of the unfortunate whose lungs are weak, whose olfactory nerves are delicate, who dare not face the wintry blast without, yet suffocate within.

[TO BE CONTINUED.]

THE ECONOMY OF EXPERIMENTS.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Owing to the paucity of financial resources our managers of enterprises have been slow in making any scientific researches connected with the apparatus used in their business. I say that this is the result of a lack of funds; in many cases it may be so, but the corporations which have the command of money, and to whom the slight expenditures incidental to the testing of any scientific problem would be a mere nothing, are apt to be the ones most prejudiced against any money being spent for such purposes. In all branches, and particularly railroads, experiments of the greatest interest could be tried which no private party can make. Authority has to be given, and the free use of tools and other machinery is absolutely necessary. It is true the experimenter cannot show the managers exactly where and how the thousand dollars expended will be returned to the company's bank account; but in the end it will benefit the road and probably save far more money than laid out for the settling of the various scientific doubts. Before I go any further I wish to state plainly that in these experiments no trials of new patents or other uncertain improvements is wished for. It is asked simply that those in charge of enterprises connected with machinery will permit experiments to be made of purely a scientific nature, having in view, perhaps, the improvements of various details, but without any direct reference to inventions and other novelties. Men having the command of money are run down by inventors wishing to push their own pet ideas or have something tried which is to revolutionize the present state of things. Naturally when these men come they almost always are refused. In the hurry of business one cannot stop to examine a multitude of useless devices, hoping all the while to come across one of some utility. Common sense tells us to be careful how we attempt to upset a system which is working well at present, or try and replace it by one never tried, perhaps, and for the success of which we have no guarantee. But the experiments that should be attempted are those which will give us a clearer insight into the working of present systems, and improve without, perhaps, altering anything but details. Many men whose knowledge is sufficient to conduct such researches are to be found, and very willingly will they give their time to the work, and money also if they could, for the sake of having their names connected with such an undertaking. But suppose such men should make the proposition to any company, they will at once be asked how it can be expected to pay; what use it will be; how will it benefit the road. All these questions can only be answered by saying that it will give a deeper insight into the workings of the various mechanical devices, pointing out certain plans of construction to be avoided and indicating various improvements in the existing state of things. It must be allowed that this answer, given to a man of business merely, is unsatisfactory. He don't care, so long as he can get money enough to declare large dividends, whether the cause of science is advanced or not; and he won't look at the benefits to be brought about by what he calls slight and unimportant changes. All these details he leaves to the master mechanic of the road, who, through much work, has long ago concluded to leave experimenting alone. Is it good economy? It seems very like stopping up the spigot carefully and leaving the copious flow from the bung-hole unchecked. We know very little about the requisite power to draw certain trains over a road. The experiments have been made in this country—so few that they can't be named; while on the Continent money and time have been spent, and engineers employed and paid, not merely permitted, as we ask, to settle just this question. There are many more questions like this one, and perhaps of greater interest, which have never been practically tested in such a manner that the results could in any way be relied upon. Take another example: What difference in power is there in hauling a heavy palace car or a light passenger car over a given road? The question is one which might shed much light on the building of cars, when we take into consideration the difference in the construction of the two cars. We know that a difference exists in roads ballasted and not ballasted, when taken in reference to the draft of trains. What is, from experiment, the advantage of the one and the disadvantage of the other no one can tell except from the roughest guess. Experiments made on one road would not be applicable to all, it is true; but experiments made carefully on one road would have a decided bearing on all, and why should not all roads make, and take pride in making, the best and most careful experiments, and then allowing the results to be published for future use of railroad men. I have mentioned one or two experiments, but the subject is large, and there are many more; also we need not confine ourselves to railroads. There are other and important industries employing machinery where researches of a similar nature could be carried on to great advantage, scientifically, and, I believe, eventually produce the practical results desired by business men. Our institutions for the advancement of science, by the work of able and talented men, are few; but our country is comparatively young as a nation, and the results produced in England in the present, and for the last few years, have been very important. The great trouble lies in the fact that it is next to impossible to induce our managers, great in the business details, to undertake anything scientific. They seem to look at science as an enemy, a thing made to take money but never by any chance return it again; but if they will consider that science has given them the tools of their present success, and in years to come is to furnish the means of higher and greater successes in every department, they may be persuaded for a moment to listen to the present wants, and, as far as in their power lies, to fill them. It is certainly the best economy to know as much as we can about the instruments we are to use. The man who knows the most will be the one least liable to throw away, as worthless, articles of value. If a man does not care to advance, but is perfectly satisfied to stay as he is, it is a hard job to convince him that there *is* any such thing as advancement. So here we will stop, and trust that our words will find arable ground, and perhaps take root.

Comparison of the Indian and the American Methods of Train Dispatching.

TO THE EDITOR OF THE RAILROAD GAZETTE:

While the systems of moving trains are under consideration, a few words may not be out of place relating to the rules laid down by "Hindoo," as the substance of the Indian system, or, as he terms them, a combination. In a former letter he has failed to see any system at all in use in America. On many roads doing a small business trains are run entirely by "time-card rules," as they were on all our roads not many years since. As mentioned in a former note, the present system in use grew to what it now is, and did not start out full fledged. As new wants became apparent, changes were made and rules added. "Hindoo" says all roads do not have rules *exactly* alike. This is true, but on examination it will be found that in general principles they are the same. All mechanics will not go to work exactly alike to produce a piece of machinery, but when done it will perform its part just as well as though the processes of production were identical throughout.

"Hindoo" has his dispatcher (he speaks of him several times, though he does not mention him as a part of the system), a telegraph operator and a station-master at each station—the station-master to do the thinking and the operator the mechanical part of the work of handling the train. The conductor and engineer have nothing to do but to take their orders and go. Now if the dispatcher is a competent man (and none other should hold such a place under either system), why not let him do a part of the work and give the orders, instead of waiting until the station-masters begin to question who has the right to the road? Why not let our conductor and engineer, who, on our American roads, are usually thinking men, do a part of this work?

"Hindoo" says the safety of the Indian system lies in precautions: 1st. "No engine is permitted to leave any station unless driver has in his possession written permission to do so," etc.

Under the American—conductor and engineer must have orders from dispatcher *to same* effect.

2d. "This permission to start shows state of road—that is, whether he is to start after arrival of one or more opposing trains—or, if he is to follow, class and time of departure," etc.

The American order from dispatcher does the same thing.

3d. "The permission to start cannot reach hands of drivers until scrutinized by three persons independent of sender, viz.: two operators and receiving agent," etc.

The American system puts the order under the eye of the receiving operator and conductor as well as of the dispatcher.

4th. Gives condition of road, etc.—being information for dispatcher or station-master.

Under our system this information is given to the dispatcher in substantially the same way. Each train is reported at once on its arrival and again on its departure.

5th. "The integrity of the system is preserved by an inspection of books in which copies, etc., are kept, and by compelling drivers and conductors to report omissions," etc.

Everything of this kind is recorded under our system. Copies of all reports and orders and sheets showing the state of road as to trains, arrival and departure of all trains, number of cars, etc., and are inspected by a superior officer. There is no officer under the name of "Inspector," but every Superintendent and Chief Dispatcher is an inspector, and, if he does his duty, examines thoroughly what is done and how.

"Hindoo" would like to be informed how a "butting" collision is possible. It is not, if rules are followed, and the same may be said of the American system. If rules are not followed under any style of management trouble is likely to follow. In the many "butting" collisions alluded to in this country, most if not all have been where there was but an imperfect system of dispatching, or where there was none at all, and only time-card rules were relied on. The value of any system is seen only in its perfect execution. The Westinghouse brake, without the air-pump, would not succeed; nor would any one see its merits if there chanced to be imperfect connection in the train he examined. It would be unjust to condemn the locomotive as a whole, because there have been many that failed in some particulars.

Where you can see 1,800 or 2,000 trains per month, handled on a single track under any system, without delay or accident, there is some evidence of safety and efficiency.

Usually a signal which answers to Hindoo's "main signal" is used. Semaphores have not come into general use, but they would add to safety. It might be well to have signals weighted against trains. That there is room for improvement in our machinery we will admit; but that we must make our organization cumbersome and disregard expense we do not believe.

Safety is only a relative term at best, and statistics show that even the block system is not perfect. Note, for instance, the report of the Massachusetts Railroad Commissioners, mentioned in your paper of March 30, where it is shown that on British roads one passenger in 430,000 was injured, while on Massachusetts roads only one in 1,475,000 was injured. This, to the surprise of all, shows that the more "perfect" system of British roads has not been safer than the "unsafe" American system. If the manner of movement has been more perfect on British roads, there has been some other point in which they are behind. Can "Hindoo" give statistics of like character of Indian roads, that we may see the results of the system as he has seen it?

X.

Safety Brakes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of the 13th instant you call the attention of your readers to the report of the Massachusetts Railroad Commissioners, in which they make a pointed allusion to the Westinghouse and Steinard train brakes as possessing such important advantages over other train brakes that have been experimented with, and their being in constant use and not reserved for emergencies, when they are not apt to be in order.

Would it not be in accordance with fair play for you to permit me to state what the Creamer *safety brake* is, as that is undoubtedly what is alluded to in the report. I have given twenty of the mature years of my life to the study of brakes as an element of safety, both at home and abroad. I am a mechanical engineer by profession, and, while I make no claim to the infallibility of my judgment, I think my opinions on the subject in question are entitled to consideration by railroad men, and that their general adoption would promote the public interests a hundredfold more than my own. I do not wish to be understood as advancing any argument against any system of brakes that is worked exclusively by the engineer. Hundreds of inventions of the kind have been made, and some of them have achieved success for a time; but let any one of them be the most perfect success possible, it does begin to cover the question of safety as connected with the brakes.

Suppose an engine is suddenly thrown off the track from any cause; in an instant the connection is severed, and then what becomes of the brakes? To be sure they can be applied by hand, but what does that amount to under such circumstances? Suppose a rail is broken by the passing engine; in a moment the train is severed and all brake power is lost. What is wanted in such an emergency is the instant application of every brake. Suppose an axle breaks; in an instant the truck is demoralized, and in all probability the apparatus of the connected brakes is broken to pieces. I could enumerate hundreds of accidents that have occurred in years past which substantiate beyond the possibility of question that, as between the two systems of brakes, namely, connected brakes working exclusively from the engine and an independent automatic brake on every car, the latter is infinitely the most valuable. Hence I hold that the first want of any company is a safety brake. After that adopt any plan of connected brakes you choose.

Now as to the reliability of a safety brake for emergency. An unparalleled amount of prejudice has arisen against my brake from the circumstance of its having been partially adopted on many roads, always against my own judgment; and, of course, in all such cases the cars soon get changed about; the men natu-

rally conclude that if the officers believed it a good thing they would adopt it generally, and the result is it soon becomes worse than useless. Let the Creamer safety brake be adapted by any company to its entire passenger equipment, and a standing order issued that no car shall be run in passenger trains without it. Let the bell cord of the train be run (as it should always be) as straight as an air-line through the center of the cars to the center of the locomotive cab inside, where the engineer can reach it in an instant, and there be placed in front of him a card of instructions to pull the bell rope in the instant of danger, and it soon will become as reliable as anything can be. If the engineer sees danger first, he will instantly apply every brake. If the conductor or brakemen, they will; if the train is broken apart, the brakes will be automatic. Each car is independent of each other. Let this be done and the whole ground of public safety is covered by a simplicity and cheapness of mechanism as yet unequaled.

My safety brake was never intended as anything but a safeguard, and my object was to make it comprehensive, simple and cheap. The poorest company need not be without it. It is so intimately identified with the existing brakes and bell-cord that it cannot get out of order without its being known. Nothing but the very grossest neglect can make it fail. It will prevent and mitigate a larger range of the accidents to which trains are liable than any previous invention ever made, and it will cost less money in the first instance, and less to maintain. It is the primal necessity of every road having the largest amount of safety in view. Adopt any system of connected brakes desirable, as a matter of convenience; but the Creamer safety, or its equivalent, is yet indispensable.

WM. G. CREAMER.

The Chicago & Canada Southern and the Canada Southern Railways as Passenger Routes.

In your issue of the 23d of March an article appeared in reference to the above roads, in which the writer undertook to reconcile the seeming inconsistency of a portion of the directors of the Lake Shore & Michigan Southern Railway being concerned in a project which appears to be competing. The theory advanced in that article is something I do not propose to discuss, but the more important question of the position these new lines will assume upon their completion. The writer of the article referred to very justly concludes that, being shorter and more direct, and with their low grades, these lines will at once take a prominent position as great freight roads, which is undoubtedly true; but he argues that as a passenger route it will not become competing, for the reason that it will have no local business, as it passes through no towns of importance. To correct this view, which from the writer's stand-point unquestionably seemed true, I propose to give some facts that appear to me to demonstrate that it will do an immense passenger as well as freight business. In the first place, then, no road running from Chicago to New York can make the run in so short a time and so safely; the distance between Chicago and New York by these lines being 45 miles shorter by actual measurement than by the Lake Shore & Michigan Southern Railway and 33 miles shorter than by the Michigan Central and Great Western railways; and at least 80 miles shorter than the former and 70 miles shorter than the latter, when you take into consideration the question of grades, together with distance. The run from Chicago to New York will be made, with *perfect ease, regularity* and *safety*, in 26 hours over this new route, which cannot be done over any of the other existing lines. It can be made as much quicker than that as competition may require. That the shortest, safest and quickest route will control and command the *through* travel any one will admit: and the *cream* of the through travel, which is now divided between the Pittsburgh, Fort Wayne & Chicago, the Lake Shore & Michigan Southern, and the Michigan Central and Great Western railways would naturally gravitate to this straight and level road. As to the other statement, "that there will be no local travel," of the Chicago & Canada Southern Railway I cannot speak with so full knowledge as I can of the Canada Southern, being less acquainted with its locality, though I am credibly informed the country is quite as good as that through which the Michigan Southern or Michigan Central passes, crossing numerous north and south lines, which will all make business for the shortest and best East and West line. As for the Canada Southern Railway I can say that, starting at its western terminus, a line is already being located, to be built this season, from Toledo to Amherstburg, giving Toledo and her system of railroads a line 25 miles shorter to Buffalo and New York than by the Lake Shore & Michigan Southern Railway in actual distance, saying nothing of comparative grades. Passing eastward this line is within six miles of Chatham, and a branch line from this important point is already arranged for. London and St. Catharines have lines of road already in operation to connect with this. Ingersoll, Woodstock and Hamilton are also pushing out branches to connect with this line, as by the Canada Southern they are nearer Chicago and Buffalo than by any existing route. Hamilton will be 20 miles nearer Chicago than by the Great Western and Michigan Central Railways; so will Toronto and Brantford. In fact, there is no town of importance in the Province that is now served by the Great Western Railway but will become tributary to the Canada Southern Railway, and they are all urgently at work to avail themselves of this route, which promises to them low rates and cheap fares. As to the country traversed by this line, I can say that it is the garden of Canada. The line was located to obtain the shortest route, and the grade of *fifteen* feet to the mile, no other question having consideration; but in so locating it, the country lying between the Great Western Railway and the north shore of Lake Erie was about equally divided, and the route thus selected accommodates the richest and most valuable farming lands in the Province of Ontario, and the thriving villages on the lake shore. To a person at all familiar with this belt of country, it must be very apparent that a fine local business, and one that will increase with rapidity, is beyond all dispute assured to this line on its opening, and, with the present wise determination of its managers carried out (to foster local trade by low rates for both passengers and freights), a local business unknown to any existing line in Canada is certain. Passing from the main line to the branch from St. Thomas to Mooretown, we have a line running through the heart of the great oil region of Canada, and striking Michigan at St. Clair, to which point all of the important lines lying north of Detroit are looking as their outlet to the East, among which are the Flint & Pere Marquette, the Michigan Midland, the East Saginaw & St. Clair, the Peninsular and a branch line to Detroit. By this route Detroit is five miles nearer Buffalo than by any other line built or that can be built. Grand Rapids, the second city of importance in Michigan, will be only 351 miles from Buffalo, and Saginaw only 274. Bay City and the other growing towns of the pineries are equally favorably situated.

The great Northern Pacific Railroad will send its passengers and freight this way East. The importance of this new route to the East, the West and the Northwest, together with the Southwest and St. Louis, is so great (and so time will prove it) that one would be charged with buncombe if he but merely hinted at what is sure to come to pass. And so, let us wait.

C. S. R.

Improvement in Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Having read of late accounts of numberless railroad accidents, many of them heartrending in the extreme, the writer would suggest a plan whereby the majority of them might be avoided and others rendered comparatively harmless in their results. The plan proposed dispenses entirely with wooden cross-ties, and uses instead long stone, similar to curb-stone, set edgewise, faced on top, making a smooth surface for the rails; the cross-ties to be iron rods running through the stone or rail-bed, secured by a head at one end and nut screwed on at the other, at a proper distance apart to keep the stone in their places, and laid below the surface of the ground, the rails to be laid on the bed, with thick paper, gutta percha, or some such substance between them and the stone, to prevent any jar or tremor that might be felt if laid on the bare stone, and fastened down by clamps or jaws lapped on to the rail and secured by a small bolt let down into the stone, and keyed at the lower end by means of a hole drilled in the side of the stone at the lower end of the bolt, and the other end by a nut screwed down on top of the clamp, the track between the rails and also a space on each side to be graded and covered with a thick coat of concrete. By having the rails bear their full length on a solid, even surface we get rid of that jostling, dancing motion, so disagreeable and dangerous on our "corduroy" roads. And the stone, being set 15 or 20 inches in the ground, will not be affected in the least by the frost, a very serious difficulty with wooden sleepers laid on the surface of the ground. And another thing, the rails are so securely fastened down that an expert, with a set of burglar's tools, would have a pretty tough job to displace them, and being laid on stone, they will not expand by the intense heat of the sun, and will probably last one-third longer by not having that continual friction and tremor common to those laid on cross-ties; and, the surface of the track being so smooth, if the engine by chance should get off the rails, the engineer would hardly notice it till he arrived safely with his train at the next station. Much more might be said in favor of this experiment, and also of a guard to prevent the trains from running off the road, but I must defer it for the present.

* * * * *

WM. ANDREWS, JR.

Providence, R. I., February, 1872.

[Our correspondent does not seem to be aware of the fact, that in the first railroads built in this country and Europe, the rails were laid on blocks of stone, and that the practice had to be abandoned on account of the rigidity of the stone. If his suggestion of using some elastic substance under the rails should be adopted, there would, we think, be much difficulty in keeping any such material in the proper position without considerable expense for some device for the purpose similar to an ordinary rail chair.—EDITOR RAILROAD GAZETTE.]

A Few Hints to Foremen.

To manage a gang of men properly is a matter that requires a more thorough knowledge of human nature than falls to the lot of thousands of foremen. There are hundreds of foremen on the road and in the shops who imagine that a great deal of noise, bluster and profanity is necessary to secure the performance of the greatest amount of honest labor. This is a grievous error.

If any one will take notice of a gang of men whose foreman is sour, cross and surly, handy with kicks and cuffs, and whose mouth is always full of oaths on the slightest provocation, either fancied or real, it will be seen that the men care little for what they are doing. They always keep at least one eye on the "boss," and as soon as his "back is turned" they commence to "soldier" at once. If he leaves them for a while, they are not anxious to make a good showing on his return, for they are sure of a season of abuse, however faithful they may have been in his absence. There is nothing to encourage them to extra exertions, and all they care about is to get along as easily as possible until pay-day.

Honest, skillful workmen are not likely to stay with such a man any longer than they are obliged to, and such foremen can seldom keep other than a gang of reckless, third-rate workmen together. They are continually in trouble; but little work is done, and that in a slovenly manner. Usually this kind of men manage their work without any system or regularity. The men get in each other's way; they get each other's tools; they take hold of things at the wrong end; everything is hurry and confusion, and the foreman imagines that because he has made a great deal of noise and the men have exerted themselves tremendously he has accomplished wonders, while in reality he has done but little.

At times a dozen men are set to perform what might easily be done by half that number; at other times a half-dozen men are expected to do what would require the united efforts of twice that number. These foremen do not know how much a man can or ought to do. They go to work on a job headlong, without exercising any forethought or judgment, and the latter is seldom possessed by the class of men in question. These men have a very high opinion of their ability, and they cannot see how the company could get along without them, when the fact is they are a positive injury to any company which may be so unfortunate as to employ them.

It frequently happens that a working train must be loaded or unloaded as quickly as possible, in order to get out of the way of regular trains. Or, perhaps, a gang of trackmen have a piece of track up for repairs, when there is necessity for extra exertions by all hands to make things safe. At such times a foreman who is usually free with his abuse is likely to get into trouble. He urges his men with kicks and threats, and trying to hurry them is like trying to drive a toad through a barrel of tar.

On the other hand, if a foreman is of a kind disposition, possessed of a cool head and good judgment, with a friendly feeling existing between himself and the men under his charge, they need no urging in cases of emergency. A cool-headed man is usually possessed of good judgment, and knows how to place men so that they can work to good advantage. Every move counts, and work is rapidly performed without any seeming hurry, whereas the snarly, quick-tempered man will worry and fret both himself and every one around him and accomplish but little. Good nature is indispensable to the successful management of workmen, but it should be accompanied with sufficient firmness and decision to prevent any undue liberties on the part of the workmen.

In the machine shop, the foreman who has the last-mentioned qualifications will have everything ship-shape. Every workman knows what would displease the "Boss," and takes especial pains to have everything in good order. He does his work in the best manner, both for the praise he expects to receive from his foreman and the interest he feels in the welfare of his employers.

When a workman knows that faithful, honest labor is appreciated, he is not slow to take a lively interest in the work in hand, and it is of great importance that individuals or corporations employ no foremen who are continually at war with the men under their charge.

WM. S. HUNTINGTON.

A Cause of Broken Rails.

ST. JOSEPH, Mich., April 6, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice an article on weight of rails in your number of March 23, also one in March 30. It is taken for granted that the cause of breaking of rails is the small size and weight. I would suggest that you advertise for information from all engineers in charge of railroads in operation in relation to the causes of the breaking of rails. I think that you will find that the cause lies in improper spacing of ties in most cases. It is evident that if the rail be laid on a stringer there would be no danger of breaking, and the closer the ties are placed the less chance for breakage, however small the pattern. We have had two rails only broken in track this winter, and these were broken in track badly tied; in both cases the spaces were double what they should have been. On all the rest of the track ties are two feet from center to center, and uniform, and I do not anticipate a break until the iron is worn too long, which might be the case if the iron was heavier.

It would be well, I think, to ascertain also if the suspension joint, or joint between ties, does not cause more breakage than the joint placed carefully on a tie with fish-plate rail.

Statistics upon the subject, monthly, from all railroads would be valuable.

C. LATIMER,
Chief Engineer Chicago & Michigan Lake Shore Railroad.

Longitudinal Timbers and Broken Rails.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Mr. A. C. Mitchell says, in your issue of April 13, that the difficulty of proper drainage applies as much to the wood rail I recommend as to the longitudinal bearings recommended by Mr. Seymour. This is true only if I insist that the wood rail be laid directly in the ballast—a system which has much to commend it; but there is no reason why this rail may not be laid upon cross-ties as readily as any other.

I called attention to the wood-rail—in response to your editorial on "Broken Rails"—assuming that its use would necessarily preclude the possibility of a broken rail and resultant disasters.

If there has been any experiment, or if there be any principles of engineering, going to disprove the claim I have made for our wood-rail, I would be glad to see a statement.

EMMETT DENSMORE.

No. 4 Hanover street, New York.

Railroad Trestles—A Criticism.

ST. CLAIR, Mich., April 4, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I suggest the following criticisms of the plan for the "M" trestle bent illustrated in your issue for March 30.

By what principle of mechanics is the author justified in

placing his diagonal bracing at the *bottom*, instead of the top of the bent?

Is it not false economy to cut off the cap so short (9ft.) that any one caught by accident on the trestle must inevitably be killed?

Would it not pay to leave the cap 12 or 14ft. long and spike on it at each end a 3 x 12 or 4 x 12 longitudinal stay-plank for the sake of the greater longitudinal stiffness, independent of the greater safety from accidents and convenience in raising?

Do not the 3 x 8 plank spiked under the stringer to prevent its moving longitudinally still leave it free to spread laterally, and would not a bolt down through it to the cap be safer and better? W.

General Railroad News.

CHICAGO RAILROAD NEWS.

The Lake Shore Union Depot.

Nothing has yet been done in regard to the site for a depot at the foot of Washington and Monroe streets, although the railroad companies interested are awaiting the development of events, and are not making any present move in the direction of trying to get another location. They find that there is an overwhelming public sentiment in the city in favor of the building of a grand passenger depot in front of Michigan avenue. Even the great majority of the property holders on Michigan avenue, most deeply interested in the question, are doing all they can to remove the obstacles to the railroad companies' obtaining possession. The only prominent men who still oppose the use of the ground for a passenger depot are J. Young Scammon and Matthew Laflin.

The iron merchants have been awaiting the decision of the question with a good deal of interest, as, if the depot should be located and built on the lake front between Monroe and Lake streets, they propose to locate their business on the lake front between Monroe and Van Buren streets.

Illinois Central.

The Illinois Central Company have already commenced work on the outer breakwater, to complete the contract of last year. If Congress should provide an additional appropriation of $150,000, as it is expected to do, the work will be pushed southward again this season as rapidly as it conveniently can be. Already the basin begins to assume the appearance of an immense outer harbor, which it is destined to become.

This road has resumed the business of transporting the grain that is offered along its line, with the exception of corn.

The company reports as follows its receipts for the month of March:

Land Department.

Acres construction lands sold	3,965.48 for	$35,162 60
Acres free lands sold	520.00 for	6,695 80
Total sales during the month of March, 1872	4,485.48 for	$41,858 40
To which add town lot sales		320 00
Total of all	4,485.48 for	$42,178 40
Cash collected in March, 1872		$72,432 85

Estimated Earnings—Traffic Department.

	In Illinois 707 miles.	In Iowa 402 miles.	Total 1109 miles.
Freight	$306,485 00	$50,232 00	$356,717 00
Passengers	106,550 20	36,957 85	143,508 05
Mails	6,375 00	3,059 32	9,434 32
Other sources	60,625 00	1,890 68	62,515 68
Total, March, 1872	$480,035 20	$92,139 85	$572,175 05
Total actual earnings, March, 1871	456,155 08	107,442 57	563,597 65
Increase, 1872	$23,880 12		$8,577 40
Decrease, 1872		$15,302 72	

This is an increase of 5¼ per cent. in the Illinois earnings, a decrease of 14 per cent. in the Iowa earnings, and an increase of 1½ per cent. in the total earnings.

Navigation and the Grain Business.

A very large number of vessels in the harbor are now lying heavily loaded with grain for the lower lakes. These vessels have all been loaded during the winter, having been moved to the elevators for the purpose during the milder weather. They get an average freight rate of 12½ cents for these first loads. The Mackinaw Straits are not yet free from ice, and so none of these vessels have yet left the port. The fact that they will all go loaded, while the elevators are all full, will cause it to be from one to two weeks after their departure before the elevators can be relieved, since the vessels from below must arrive before such relief can be afforded.

New Elevators.

In the meantime work is rapidly progressing on the new elevators, which are to be larger than the ones they replace, and will give the city by next September an aggregate grain-storage capacity of some two million bushels more than before the great fire.

Chicago, Clinton & St. Joseph.

Mr. F. E. Hinckley, President of this company, has been in New York for two or three weeks looking after the various railroad interests with which he is connected.

The company are going to work next week to finish up the work on the road between Clinton and Iowa City.

Chicago, Burlington & Quincy.

This company completed its track to the Mississippi opposite Clinton, Iowa, on Wednesday, the 17th inst. Cars will be run to that point within a few days; as soon as arrangements can be perfected for ferrying freight across the river. In the meantime, negotiations are in progress for the purpose of leasing the right of way across the Northwestern bridge at that point.

Michigan Central.

This road does not at present contemplate any change of running time for the summer, which, indeed, is usually settled by a conference of the three lines to the East. The present time-table is substantially the same as that of last summer, and is probably about as good as could be made in order to adapt it to the connections of Eastern roads, as well as to accommodate the local traffic, and the present time-table is as good as could be made to accommodate the present and prospective running time of Western roads.

The Chicago & Michigan Lake Shore Company having completed its track to Pentwater, Michigan, the Michigan Central will put on trains to run through from Detroit and Chicago to that place, commencing on Monday, the 22d inst.

The new cars are now used in the express trains, and the company rightfully feels very proud of them. The passenger business is just about what it was last year this time, while the freighting business is heavier.

Chicago & Alton.

The earnings of this road for the first week in April of the present year were $87,753.26; for the corresponding period last year they were $97,369.28, or $9,616.02 more than for the present time. But last year grain was being shipped in large quantities to the city, while at present there is no room for it, and so it cannot be transported. This will account for the falling off in receipts.

Chicago, Danville & Vincennes.

This company is pushing forward the branch to the Indiana coal mines. A part of the iron has already been received. The engineers find that the steepest grade will be but 26 feet to the mile. The new branch will bring the famous block coal region of Indiana 50 miles nearer the city than now, and is expected to cheapen the coal at least one dollar per ton.

The company, together with the Columbus, Chicago & Indiana Central Company, has nearly completed the purchase of a site for a fine passenger depot on Halsted street, near Kinzie street.

Chicago & Northwestern.

This company has just consolidated the Harlem and Oak Park stations on the Galena Division. The new station will be just half-way between the two old stations.

Lake Shore & Michigan Southern.

This company has just established the headquarters for the general offices at No. 95 Harrison street, where they will remain until the completion of the great depot building.

Street Railroads.

The street railroads of the city are making a move toward the use of each other's lines, so that a single fare will take a passenger from almost any point in one division to any point in any other division. It is proposed, as an experiment, to run a car from Twenty-second street to Halsted street, for instance, for a single fare, and *vice versa*. It is not impossible that the lines may come to an agreement whereby a single fare will take a passenger from the outer terminus of one road to the outer terminus of another, which will be a great boon to the people, in the present and prospective scattered state of business.

ELECTIONS AND APPOINTMENTS.

—Mr. James D. Brown has been appointed General Ticket Agent of the Missouri, Kansas & Texas Railway, with headquarters at Sedalia, Mo. Mr. H. D. Mirick, who heretofore has been General Freight and Ticket Agent, remains General Freight Agent.

—Mr. James Murray, for some time a Train Dispatcher of the Chicago & Alton Railroad, has been made Assistant Train Master, in charge of the Missouri Division.

—George M. Gray, who was for some years the Freight Agent of the Lake Shore road in Chicago, and has been latterly General Agent in Chicago of the Pullman Palace Car Company, has removed to New York, where he acts as General Eastern Agent of that company. Mr. Gray is an accomplished railroad man of extensive and varied experience.

—Frank J. Firth, Auditor of the Empire Transportation Company, has been elected Vice-President of the Erie & Western Transportation Company.

—Joseph T. Wilson, for some time in the auditor's department of the Empire Line, has been appointed Auditor of the Erie & Western Transportation Company.

—The annual meeting of stockholders of the Green Bay & Lake Pepin Railway Company was held at the company's office in Green Bay, on the 8th inst. The following board of directors was chosen for the ensuing year: Henry Ketchum, Fred S. Ellis, George Sommers, W. J. Abrams, M. D. Peak, W. E. Peak, Walter Scranton, E. A. Bradley, Samuel Marsh, Jr. At a subsequent meeting of Directors the following officers were elected: President, Henry Ketchum; Vice-President, George Sommers; Secretary, F. S. Ellis; Treasurer, E. J. Shaylor.

—L. W. Filkins, for some time passenger agent of the Atlantic & Great Western Railroad in Cleveland, has been appointed General Eastern Passenger Agent of the Missouri, Kansas & Texas Railway, with headquarters at Buffalo.

—It is reported that Charles W. Mead, formerly General Superintendent of the Hannibal & St. Joseph Railroad, afterward Assistant General Superintendent of the Union Pacific, and at present President of the Omaha Smelting Works, has been appointed General Superintendent of the Northern Pacific Railroad. Mr. Mead was educated in railroad management on the Chicago, Burlington & Quincy Railroad under Colonel C. G. Hammond, and has an enviable reputation as a manager of traffic.

—At a meeting of the Rondout & Oswego Railroad directors, at Kingston, N. Y., on the 10th inst., John C. Brodhead, President, tendered his resignation, which was accepted, and Gen. George H. Sharpe elected to fill the vacancy.

—At the annual meeting of the Southern Minnesota Railroad Company, held in Wells, Minn., on the 4th inst., the following were chosen directors: Clark W. Thompson, Wells; Thomas B. Stoddard, LaCrosse, Wis.; Henry W. Holley, Winnebago City, Minn.; Augustus Armstrong, Albert Lea, Joseph W. Sosey, LaCrosse; James W. Polleys, Wells; P. M. Meyers, New York; Albon P. Man, New York, and Benjamin G. Lennox, Wells.

—At the annual meeting of the International Bridge Company, in Buffalo, on the 12th instant, the following officers and directors were chosen: President, C. J. Brydges; Vice-President, E. G. Spaulding; Secretary and Treasurer, Joseph Hickson; Directors, A. Walsh, James Ferrier, E. C. Sprague, J. Bell and R. P. Jarvis.

TRAFFIC AND EARNINGS.

—The Kansas Pacific reports that the earnings for the month of March were $292,670.80, which is at the rate of about $5,200 per mile per year.

—The earnings of the Lake Shore & Michigan Southern Railway for the first week of April were: 1872, $334,000; 1871, $294,000; increase, $40,000, or 13½ per cent.

—The earnings of the Toledo, Wabash & Western Railway for the first week of April were: 1872, $109,841; 1871, $100,018; increase, $9,823, or very nearly 10 per cent.

—The Erie Railway Company reports that its earnings for the first week of April were: 1872, $356,514; 1871, $300,949; increase, $55,565, or 18 per cent. At this rate the earnings would be about $18,500,000 per year.

—The earnings of the Erie Railway for the month of March were: 1872, $1,434,561, which is at the rate of $17,214,768 per year.

—The Union Pacific reports thus late its earnings for February, which were: 1872, $534,115; 1871, $373,925; increase, $160,190, or nearly 43 per cent. This may seem extraordinary in view of the fact that the road was closed by snow a large part of the month; but it is explained by the fact that a very large part of the legitimate business of January, which the blockade delayed, came over the road in the latter half of February. The earnings for January and February, which include most of the period of the blockade, were $808,051, or only $45,446 less than in 1872. The expenses, however, were greatly increased by the blockade, being for the two months $772,096, or no less than 95 per cent. of the receipts, leaving but $35,955 as the net earnings of the first two months of the year, which is less than one-eighth of the net earnings for the corresponding period of 1871.

If we take the three winter months, during which occurred the only serious delays on account of snow, we have the earnings $1,338,051 for the past and $1,358,550 for the previous season.

—The following is a comparative statement of the earnings of the Chicago & Northwestern Railway for four months ending March 31, 1872:

December, '70	$712,012	December, '71	$772,012
January, '71	655,427	January, '72	765,412
February, '71	601,481	February, '72	699,326
March, '71	774,993	March, '72	864,698
Total	$2,744,913	Total	$3,001,448
Total increase			$346,585

The increase for the four months is 12½ per cent., and for the month of March nearly 8 per cent. This is with a very small increase of mileage.

PERSONAL.

—Stephen R. Johnson, Road Master on the Michigan Central Railroad for eighteen years, and in the employment of the company for twenty-five years, died at Niles, Mich., on the 27th ult.

—General Ira Spaulding, Chief Engineer of the Minnesota Division of the Northern Pacific Railroad, having completed the duty of laying out the line from Lake Superior to the Red River of the North, and being about to resign his position, the assistant engineers in his department presented him with a watch, two chains and a moss-agate ring—the whole valued at $575.

—Mr. Edward A. Flint, who was formerly for several years an engineer in South America and has lately been Chief Engineer of the Western Division of the Northern Pacific, has received an appointment on one of the railroads which Henry Meggs is constructing in South America, and sailed recently in company with James R. Maxwell, formerly Division Engineer on the Union Pacific and recently on the Northern Pacific, who has also received an appointment in South America.

—The Peoria *Transcript* reports that Mr. J. S. Oliver, General Superintendent; Mr. John T. Otis, Master Mechanic, and Mr. S. S. Smith, Master Car Builder, of the Indianapolis, Bloomington & Western Railway, have all resigned.

—Erastus Corning, a great iron manufacturer of Albany, who has had large interests in railroads and has been a great power in national and State politics, died on the 8th inst. at the age of seventy-eight. Mr. Corning was the first President of the consolidated New York Central, being succeeded by Henry Keep, who was the immediate successor of the present incumbent. At the time of his death he was a director of the Michigan Central, the Chicago, Burlington & Quincy, and the Burlington & Missouri River companies.

—Oliver Charlick, President of the Long Island Railroad Company, is spoken of as the Democratic candidate in the Eighth Congressional District of New York.

—Edwin F. Johnson, one of the most eminent of American engineers, died on the 12th inst., and was buried at his home in Middletown, Conn. Mr. Johnson has held leading positions on prominent railroads for many years, having been recognized as eminent in his profession as early as 1840. He was Engineer-in-Chief of the Northern Pacific Railroad until a little more than a year ago, and since has been Consulting Engineer of that company.

RAILROAD GAZETTE

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A. N. KELLOGG, *Proprietor.*

S. WRIGHT DUNNING AND M. N. FORNEY, *Editors.*

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Editorial Announcements.

Address.—The RAILROAD GAZETTE *will be printed for the present in New York; our printing house in Chicago having been destroyed. All communications, therefore, whether editorial or business, should be directed to the New York office. The proprietor will receive subscriptions and advertisements at his office in Chicago, Nos. 63 and 65 South Canal street, but letters should be addressed to New York.*

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

LOCAL TRAFFIC ON THE CANADA SOUTHERN.

The Canada Southern Railway and its connection with Chicago across Michigan and Indiana we described recently as admirably situated for a great freight traffic because of their directness and extraordinarily easy grades, but as very poorly placed for local traffic, because of the fewness and smallness of the towns on the lines. A correspondent intimately acquainted with the Canada Southern sends us a letter, published in this paper, in which he takes issue on this point, and claims that these roads will have a very large local, as well as through traffic, because, first, they pass through a rich country, which is true, and, second, because they will cross many lines which will bring them traffic, and because numerous branches will be made connecting them with the chief towns in the vicinity. As to the first argument, the richness of the country, that only shows that it will furnish a large traffic, but does not show that it will go to the Canada Southern. It would if that road was the only route which could accommodate it, or if it should afford transportation at lower rates than its rivals. Now the point we made was that this long line, for nearly every mile of its length, will be very near a competing line already established. The large towns are all on these competing lines, and the traffic will go preferably to these towns. It can be diverted from them by low rates, and it may be said, doubtless with truth, that the new roads can afford to carry for less than the old roads can; but the fact is that the *cost* of transportation has scarcely anything to do with the *price* in such cases. As all the world knows—at least, as all shippers and transporters know—the rates by all routes to common or adjacent points are the same. If the best route—that is, the one which can carry at the least cost—makes the rate as low as it can afford, the others will come down to its rate though it be less than they can afford. If, for instance, the Chicago & Canada Southern shall make the rate on wheat to Buffalo eight cents per bushel from Tecumseh, Mich., we may be pretty sure that the Lake Shore & Michigan Southern, which has a branch through that place, will make the same rate, and that the Michigan Central will make the rate from Manchester, ten or twelve miles further north, eight cents also. This is what makes it hard for a new road through a comparatively old country to secure local traffic it it does not reach the chief towns. The Chicago & Canada Southern will reach a few considerable towns, we believe, which are on the line of the Lake Shore & Michigan Southern, and there is no reason why it should not divide the through traffic of these places. But a very large part of local traffic not only originates at way stations, but stops at way stations; it is what may be called way traffic proper, in contradistinction from through traffic (from terminus to terminus) and what we may call "terminal traffic," or that which originates at way stations and goes through to a terminus. This way traffic depends for its bulk almost entirely upon the number and importance of the towns on the road. The Lake Shore & Michigan Southern is an eminent instance, having such important places as Erie, Cleveland and Toledo on its main line, to say nothing of the long list of considerable towns on the Michigan section of the road.

As to the business which crossing and connecting roads may bring the new line, that also will be properly "terminal" and not way traffic. Moreover, nearly all the roads already completed have their connections established and are controlled by one or the other of the existing lines. If new roads are made as feeders of the Canada Southern line, they may bring it considerable traffic, but it can hardly be called the local traffic of the Canada Southern.

However, we do not desire to convey the impression that these new roads will have little importance. We think, on the contrary, that they are likely to be of very great importance. We do think, however, that their traffic is likely to be of a peculiar nature, and that their value will be chiefly in that capacity for which they have evidently been designed—the transportation of through freight.

As for passenger traffic, there is no doubt that such a road can carry through passengers as well as any other and probably at less cost. But the influence of grades—up to a certain degree, at least—is less in limiting speed than in requiring an increase of power. Two engines will not draw a train twice as fast as one, but they will ascend a heavier grade. This was indicated very plainly two or three summers ago when the Pennsylvania Railroad insisted that its fifty miles advantage in distance between Chicago and New York was equivalent to two hours in time. The northern lines claimed that its advantage in distance was counterbalanced by its disadvantage in grades. They could not agree, and the result was the running of trains about as fast as the companies dared. The Pennsylvania maintained its time two hours less than its rivals, and, we are credibly informed, would have made its time four hours less had the other companies reduced their time to its figures. Curves do make it impracticable to run at the highest speed, but grades only make it costly to do so.

We did not think of the neglect of passenger business by the Canada Southern as necessary, but as not improbable in view of the possible cultivation of an immense freight traffic which would be more profitable than any passenger traffic could be—a traffic which should have intervals of but a few miles at most between trains, which, moreover, should run slowly to be moved economically. We need not say that, with such a traffic, it would be difficult to run passenger trains, and that the expense of hurrying freight trains to get out of their way would be great. This would not be the case, of course, unless the new line should secure a very much greater traffic than any now existing; but that is just what we supposed its managers intended to make it do. A railroad line which will carry freight between Chicago and the seaboard at lake and canal rates will have no room for passenger trains so long as it has but two tracks. That the Canada Southern will have such a traffic is of course not certain, but we believe that it depends more upon the rates which shall be fixed than anything else. If it has no unusual freight traffic there will be, of course, no obstacle to running passenger trains at high speed and the development of a large through business. If, however, freight can be carried at a trifling profit at the rates named, we believe it would be much more profitable to run 40 freight trains each way daily and no passenger trains, rather than two or three fast and pretty full passenger trains, which would prevent the running of so large a number of freights.

STEELED CAR WHEELS.

There is perhaps no part of the equipment or material used on railroads whose manufacture is attended with so many difficulties and requires so much care, skill and experience as the casting of car wheels. The duty which they must perform, the disastrous results which are liable to follow a fracture, and the severe wear to which they are exposed, all make it very important that they should have each one of the qualities which are requisite to resist the shocks and strains to which they are constantly exposed while in use.

As nearly all our readers know, in this country cast-iron car wheels are used almost exclusively. A few wheels with steel tires have been introduced, but at present the number of these in use is comparatively small. The lower price of cast-iron wheels, the capacity of the tread and flanges to resist wear, and the fact that they are composed of one piece only, instead of being constructed of a number in combination, have recommended their use, and thus far at any rate have prevented the introduction of either wrought-iron, wooden or steel wheels in their place.

In a recent visit to the car-wheel works of Messrs. A. Whitney & Sons, of Philadelphia, we had an opportunity of examining very thoroughly the process of casting car wheels at that establishment, and probably to many of our readers a description of it will not be without interest or instruction.

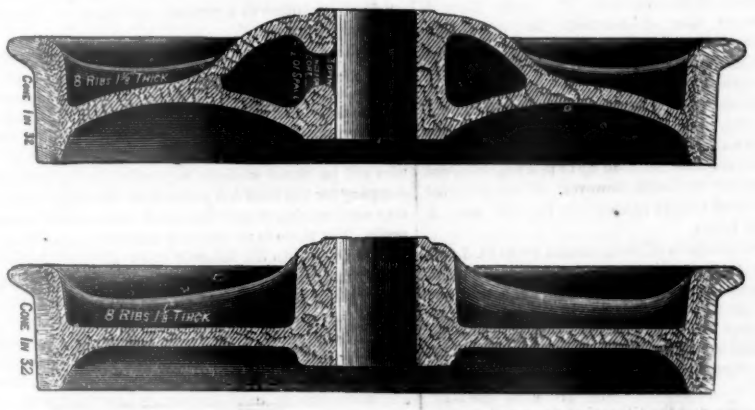
Nearly all the wheels made there are of one of the two patterns represented in section by the engravings below.* The one is known as the "single-plate," and the other the "double-plate" wheel.

Neither of these patterns seems to possess any very marked advantages over the other; the preference of the single or double plate being determined to a very great extent by mere individual opinion, preference or prejudice. The mere form of car wheels does not seem to be an element of much importance, or, at any rate, it is not a feature which presents any serious difficulty in their manufacture. The great trouble is to secure in the metal, first, the requisite strength to resist the strains and shocks to which the body of the wheel is subjected, and, second, sufficient hardness in the tread and flange to stand the wear to which they are exposed. The latter quality is produced by the well-known process of chilling, which is done by making that portion of the mould which forms the part of the wheel to be chilled of cast iron, and allowing the molten metal to come in contact with the cold iron, or "chill," as it is called, until it cools. With certain kinds of iron the result is that the portion which is cooled suddenly by the "chill" assumes a very peculiar crystalline form of extraordinary hardness. The depth to which this crystallization or chilling will penetrate varies with almost every brand and quality of iron. In some it will extend one or two inches, in others it will not take place at all. The cause to which this chilling property is due has never been discovered. All that we know is, that some iron will chill and other will not. That which chills most is nearly always very hard and brittle—a quality which is just the reverse of that required for the body of the wheel, which must resist transverse strains, vertical shocks and blows of almost every description. The metal for this portion of wheels should therefore be tough, or capable of resisting a high transverse strain; that is, if a bar of it is placed upon two supports, one under each end, and loaded in the middle, it should be capable of bearing a heavy load without breaking. In order to do this, it must have considerable flexibility—that is, be capable of bending, and at the same time have a high tensile strength. Hard, white iron which chills easily has a very high tensile strength, but is so brittle that it will not bend; and if it is exposed to a transverse strain it will therefore break with a comparatively light load. A bar made of iron of less tensile strength but more flexibility will bear a heavier transverse strain because it will bend or yield before breaking. On the other hand iron may be too soft and flexible, and have so little tensile strength that it will yield like a bar of lead, and therefore will bear less strain transversely than that which has less flexibility but more tensile strength. Therefore iron which has the two qualities of flexibility and tensile strength *combined* in the highest degree is the best suited for the body of the wheel. For the tread and flange it must, of course, have the chilling property. Iron for car wheels should therefore have the three following qualities *combined:* first, the chilling property; second, a considerable tensile strength; third, flexibility or capacity for bending before breaking. The second and third in combination are what give a high transverse strength. Hard, white iron will chill easily and has also a very high tensile strength, but is very brittle and will break easily if strained transversely. A very soft gray iron will bend easily, but will not chill, and has very little tensile strength.

Now, it may seem that wheels of any desired hardness in the tread and softness in the body could be made simply by mixing in the right proportions different kinds

* The engraver has attempted to represent the appearance of the chill in the tread of the wheel, but it is impossible to show by wood engraving the peculiar granular and crystalline appearance of the soft cast iron and the hard chill.

of iron which have these qualities. It must be remembered that the two qualities which are requisite in the metal of a wheel, the one the chilling property for the tread and flange, and the other flexibility for the body of the wheel, are to a great extent the very opposite of each other. If enough chilling iron is mixed with that which is soft and flexible to harden the tread, the body of the wheel will then be too hard and brittle; and, on the other hand, if less of the hard iron is used, the tread will be too soft. The fact that no iron is ever of a perfectly uniform quality presents another difficulty. The metal produced by any one furnace, even with the greatest care in charging and managing it, will vary, owing, probably, in part to atmospheric changes and to slight differences in the ores and fuel used. In making wheels there is, therefore, always great uncertainty about their quality, and in order to produce the most uniform results a great variety of different kinds of iron is used. The effect of this is, that the deficiency of one quality in one kind of iron will be corrected by its excess in another, and therefore the greater the number of irons used, provided they are combined in the proper proportions, the more uniform will be the quality of the wheels produced. Of course it is not the *mere mixing* of a great number of different kinds of iron which produces the beneficial result. A hundred different kinds might be combined and yet make very bad wheels; and the difficulty of combining a great variety so as to make good wheels increases very much with the number used; but



if a good result is once obtained by a mixture of many kinds, the production from that combination is likely to be much more uniform than if only a few were used.

Another difficulty which is often encountered is, that the chill of some metal, instead of being closely incorporated and as it were interlaced with the iron which is not chilled, will end so abruptly that in use it will frequently break loose from the portion of the wheel which is not chilled. This is especially the case with some anthracite iron. The reason of this, like that of the chilling property itself, is not known.

It will be seen, therefore, that the manufacture of cast-iron car wheels is attended with very great difficulty, and that only with the greatest care, mature experience and vigilant inspection can anything like a uniform or reliable product be made. Great skill is required in the selection and combination of the different kinds of iron used. There is, of course, a very great difference in the qualities of the various kinds of iron, varying from that which has a high tensile strength and will chill with the greatest ease, but has very little transverse strength, to that which is very soft with little tensile strength and no chilling property. Other iron—which is that best adapted for the manufacture of car-wheels—has in combination considerable tensile and transverse strength and also the chilling property in a high degree. Such iron is, however, very rare, and this combination of qualities is only found in certain kinds of charcoal iron, which, on account of their rarity and expense of manufacture, always command a high price. Some New England and a few other brands of charcoal iron have these qualities. Their average price during the past year was about $62 per ton, while the price of ordinary iron was only about $42. The tensile strength of the former, if melted in cupolas, is about 23,000 lbs. per square inch, while that of the latter will average only 18,000 lbs.

In order to make the best wheels, or those which will have all the qualities that we have pointed out combined, it is therefore necessary to use the expensive iron, for the reason that ordinary soft, flexible iron has little tensile strength or chilling property, while hard white iron, which chills easily, has a high tensile strength but is very brittle. Therefore, if we add enough of the latter to give the requisite chill in the tread and flange, the wheel will not have sufficient strength in the body. If we use more soft iron the tread and flange will not be hard enough to wear well.

Considering these difficulties and the fact that the iron which produces the best wheels costs about 50 per cent. more than ordinary pig iron, it is obvious than any means or process which will give to the ordinary metal the chilling property, and at the same time increase its tensile strength, will have great value.

Mr. W. G. Hamilton, of New York, known to railroad men through his connection with the Ramapo Wheel Works and also as the author of a little pocket-book for engineers, has been experimenting for some years to discover and perfect a process by which this could be accomplished. He found that by melting Bessemer steel with cast iron, both the chilling property and tensile and transverse strength of the latter were increased. Such a combination, therefore, gives to the metal at the same time both the qualities required for car wheels; that is, the transverse strength and chilling property. It is therefore possible with this process to secure strength at least *equal* to that of the wheels made of the high-priced chilling charcoal irons, and at a less price, because of the use of the cheaper kinds of pig iron in combination with the Bessemer metal. As the price of Bessemer steel rail ends is only $37.50 per ton, the difference in the cost of wheels made by this process and that of those made of the more expensive iron is very considerable.

Messrs. A. Whitney & Sons are now using, daily, about five per cent. of Bessemer steel with their ordinary iron in the manufacture of wheels at their works in Philadelphia. This has caused an increase of about 17 per cent. in the strength of the metal. They now make about 250 wheels per day; and, considering the extensive experience and reputation of this firm, the fact that they are willing to put the process into daily use in the manufacture of all their wheels indicates that they are fully convinced of its value.

The following letter was written by this firm, on the 3d of February last, to Mr. W. G. Hamilton, the inventor, which, with an examination of their system of inspection of wheels, indicates that the use of Bessemer steel is not a mere blind experiment, but that its value is being very carefully tested:

> In reply to your inquiry as to the results of the experiments we are making at your request, with Bessemer steel for chilled wheels, we have the pleasure of reporting that for the last two months, or more, we have been using daily two per cent. to five per cent. of Bessemer rail ends, with our usual charcoal pig irons, for all our wheels, and the *general result* has been an increased tensile strength of our whole metal of about seventeen per cent. by the steel added.
>
> The steel melts easily with the pig iron—the melted metal being quite fluid and the chill deeper than with the pig irons alone.
>
> Our pig irons all being good chilling metals, we found that we could not safely use over five per cent. of steel without making the wheels too hard.
>
> We have made a few trials in small cupola of 20 per cent. to 30 per cent. of the steel, with *non-chilling* charcoal irons, and the mixture produced a *fair chill*, but the iron used was not of a quality suitable for wheels.
>
> We will continue our experiments, and hope, by adding to our usual chilling charcoal irons a portion of *non-chilling* soft charcoal or anthracite metal, to be able to use a larger percentage of steel, believing, from our experiments thus far, that wheels can thus be made of *greater strength and at less cost than with high-cost chilling charcoal irons alone.*

The use of anthracite iron has heretofore been frequently tried in the manufacture of car wheels, but, owing to some chemical or mechanical laws, the crystallization produced by the process of chilling would not blend with the gray iron, but the one was separated from the other by a decided line of white and gray, showing the abrupt termination of the chill, which in wearing gives bad results. In a good chill test—as can be seen by the examination of a broken wheel—the chilled iron streaks into the gray, not unlike in appearance the rays of the Northern Light, when seen streaking into the blue of the sky on a wintry night. The use of steel with anthracite iron produces the effect desired, and causes the crystallization to blend or interlace completely with the unchilled iron.

Since the above letter was written, we learn that the Messrs. Whitney have used anthracite iron very successfully with about 15 per cent. of steel, and produced a very perfect chill and a wheel of the requisite strength.

In casting wheels in this establishment a test piece is cast in a chill with each dozen wheels. This is broken when it is cooled, and all the tests of each day's casting are arranged in consecutive order, so that any defect or imperfection in the quality of the metal or unusual appearence may be detected. Should any such defect be shown by these tests, some of the corresponding wheels are broken, until either the existence or extent of any imperfection may be discovered.

Each wheel is then tested by several heavy blows on the hub with a sledge to discover whether the spokes or ribs show any signs of brittleness, and the tread is carefully examined with a hardened steel chisel to discover soft places, if any exist. Frequent test pieces of metal are also cast to determine its tensile strength. These are torn apart in a testing machine, and their strength is carefully recorded. Notwithstanding the greatest care in the selection of metals and in processes of manufacture, about 10 per cent. of all the wheels made are condemned. It seems quite probable that, if the chilling property is imparted to the iron by the Bessemer steel, by its use there will be much greater certainty in producing wheels of uniform quality. That the use of Bessemer steel in the manufacture of cast-iron car wheels has very great practical value is indicated by the fact that it is in daily use in one of the largest car-wheel manufacturing establishments in the country, and is now used by the Pennsylvania Railroad Company not only in all their wheels, but also in all their other castings.

The process has been patented by Mr. W. G. Hamilton, Mechanical Engineer, of New York.

Railroad Earnings.

The following earnings for the month of March have been reported by the companies enumerated:

	1872.	1871.	Increase.	Decrease.	Per Cent
Central Pacific....	$863,050	$614,446	$248,604	....	40⅜
Chicago & Alton..	378,021	384,999	....	$6,978	1¾
Chicago & Northwestern.....	834,693	774,993	59,700	....	7¦
Cleveland, Columbus, Cincinnati & Indianapolis..	354,766	320,881	33,885	....	10⅝
Illinois Central....	572,175	563,598	8,577	....	1½
Lake Shore & Michigan Southern....	1,470,048	1,312,617	157,431	....	12
Marietta & Cincinnati.....	150,784	140,740	10,044	....	7
Milwaukee & St. Paul.....	423,193	400,149	26,043	....	6½
Pacific of Missouri.	303,594	319,964	....	16,370	5
St. Louis, Alton & Terre Haute.....	165,969	154,697	11,272	....	7¼
St. Louis & Iron Mountain.....	182,055	144,637	37,418	....	26
St. Louis, Kansas City & Northern	303,978	234,057	69,921	....	30
Toledo, Peoria & Warsaw.....	105,456	76,957	28,499	....	37
Toledo, Wabash & Western.....	460,646	393,455	67,191	....	17
Indianæ, Bloomington & Western...	119,649	71,570	41,079	....	70
Western Union....	51,054	54,220	....	3,164	6
Total.....	$6,735,130	$5,961,980	$799,664	$26,512	

This is an aggregate increase in the earnings of the fifteen roads reported of $773,150, or about 13 per cent. The Central Pacific, the Chicago & Alton, the Chicago & Northwestern, the Milwaukee & St. Paul, the Pacific of Missouri, the St. Louis & Iron Mountain, and the Toledo, Wabash & Western had a considerably increased mileage this year, but it is chiefly of new road, which has as yet a very light traffic.

The following table of earnings for the first quarter of the year gives the returns of the same sixteen companies:—

	1872.	1871.	Increase.	Per Ct.
Central Pacific.....	$2,027,509	$1,636,435	$391,074	24
Chicago & Alton.....	1,082,631	1,080,603	2,028	¦
Cleve., Col., Cin. & Ind...	1,014,181	867,458	146,723	17
Illinois Central.....	1,741,709	1,711,279	30,430	1¾
Lake Shore & Mich. S....	4,106,567	3,471,324	635,243	18¼
Marietta & Cincinnati....	445,789	397,847	47,922	12
Milwaukee & St. Paul....	1,274,744	1,124,340	150,404	13⅜
Pacific of Missouri*.....	796,736	775,040	21,696	2¾
St. Louis, Alton & T. H....	464,638	422,975	41,663	10
St. Louis & Iron Mountain	512,055	393,227	118,828	30¼
St. Louis, K. C. & Northern	788,468	617,966	170,502	27⅝
Toledo, Peoria & Warsaw.	314,053	228,669	85,414	37½
Toledo, Wabash & Western	1,332,575	1,087,420	244,955	22½
Ind., Bloomingt'n & West*	317,166	190,310	126,856	66¾
Chicago & Northwestern..	2,319,436	2,032,901	286,535	14
Total.....	$18,538,067	$16,037,794	$2,500,273	15½

* Approximate.

Compared with the entire quarter, even the large increase of March appears unfavorably; the increase for the quarter having been no less than 15½ per cent. Every railroad reporting, it will be seen, shows an increase for the quarter, and, in many cases, this increase is extraordinary. The proportion of increase shown by the Indianapolis, Bloomington & Western, being 70 per cent. for March and 66¾ for the quarter, seems astonishing, the more so as it is without any increase in mileage. It has, however, recently made arrangements which give it large addition to its through traffic, and its local traffic last year had only begun to develop. Indeed, its earnings are not now absolutely large, being at the rate only of $6,000 per mile a year for the quarter and $6,370 for the month. So the earnings per mile of the Toledo, Wabash & Western are only at the rate of about $6,500 per mile a year, and it has an increase of mileage of 20 per cent. against an increase in earnings of 22½ per cent. So of most of the roads which show a

very large increase, they are chiefly roads with a comparatively light traffic with plenty of room to grow still. The Toledo, Peoria & Warsaw returns are at the rate of $5,300 per mile per year; the St. Louis, Kansas City & Northern's, $5,400; the St. Louis & Iron Mountain's, $8,160; while that of the Lake Shore & Michigan Southern is at the rate of $16,200 per mile, and has room to increase in the proportion of 18 per cent.

Two of the three roads which bring produce to Chicago have a very moderate increase, the 14 per cent. increase of the Chicago & Northwestern being large and but little affected by an increase of about a hundred miles in the length of lines, which increase as yet adds but little to the traffic. But generally it may be assumed that the roads entering Chicago have not increased their traffic, unless from exceptional circumstances, such as a heavy crop this year against a light one last, so much as have the lines crossing Illinois south of Chicago. This is largely owing to the lack of storage room for grain in Chicago, and the insufficient provision for shipping eastward from that place. A large part of the time grain could not be brought to the city, and of course the other routes gained by this blockade. As soon as navigation is open there will be an end of this, however.

The Tracks in Fourth Avenue.

The bill pending in Albany intended to determine in what manner and on what terms the New York & Harlem Railroad shall occupy Fourth avenue provides for a gradual sinking of the track from a point between Forty-eighth and Forty-ninth streets (which is a little way above the upper end of the Grand Central Depot, and leaves the gridiron of tracks entering the depot undisturbed) for two miles or more northward, and for nearly a mile a little north of the cut the road is to run over the streets on a viaduct. Crossings are provided as follows: Foot tunnels at Forty-fifth and Forty-eighth streets; either foot tunnels or foot bridges at Forty-sixth, Forty-seventh and Forty-ninth; either tunnels or bridges for carriages at Forty-fifth and Forty-eighth; foot bridges at Fiftieth, Fifty-first, Fifty-fourth, Sixty-sixth, Seventy-second, Seventy-ninth, One Hundred and Thirtieth and One Hundred and Thirty-first streets; a foot and carriage bridge in the middle of a block between two streets, with approaches parallel to the railroad, between Fifty-second and Fifty-third, Fifty-fifth and Fifty-sixth, Sixty-fourth and Sixty-fifth, Seventy-third and Seventy-fourth, Seventy-seventh and Seventy-eighth, One Hundred and Seventeenth and One Hundred and Eighteenth; foot and carriage bridges the full width of the street at Fifty-seventh street and thence to Sixty-third, inclusive, at Seventy-fifth, Seventy-sixth, Eightieth and in all streets thence to Eighty-eighth, inclusive; at Ninety-seventh, One Hundred and Nineteenth, and thence to One Hundred and Twenty-ninth, inclusive. Between Forty-sixth and Forty-ninth streets, inclusive, iron railings are to be erected to prevent crossing on the level of the tracks, and upon the parapet and retaining walls, wherever there is an open cut, there is to be a coping and an iron railing to keep men and animals from falling in. The company is to have the right to lay four tracks in the avenue, in place of two, as at present, and to have their rights in it perpetually, whereas now they will expire in sixteen years. The work is to be done under the direction of a Board of Engineers, one the Engineer of the Board of Public Works of this city, one the Engineer of the company, and the others, named in the bill, Messrs. Allan Campbell and Alfred W. Craven, whose places, in case of a vacancy, are to be filled by the other two. One-half of the cost is to be paid by the company and one-half by the city.

The scheme provides very well for the safety of street travel, but the open cut would of course be a considerable detriment to the avenue, though incomparably less than the tracks on the surface as they now are. The property owners are opposing the bill very decidedly, and ask that the track be not only sunk but arched over. This would largely increase the value of their property; but the company, which claims that the original right of way in the avenue was given in return for certain benefits supposed to be conferred on the city, and with a knowledge that the property on and near the tracks would be injured, as residence and business property always is injured by the crossing of trains, looks upon itself as bound only to provide reasonably for safety and not at all for the improvement of property which it does not own. It therefore objects to paying for any improvements whose object is the enhancement of the value of real estate. Any scheme which will provide unobstructed entrance by which trains may approach the depot at full speed, will be of great value to the company, and very likely of sufficient value to justify it in making the entire expenditure; but the substitution of a tunnel for an open cut will not add to the safety of running and will make the route less desirable and more costly to operate. The improvement of the street is a question which concerns the company not at all and the city as a whole very little, but the owners of the adjacent property very much. If the company has no legal rights in the street, they may rightly require it to leave it, or to make it as good as if it were not there; if it has such rights, it can be required to provide against danger, but not against unsightliness or the breaking of the street. The fact that its rights in the street are limited as regards time probably inclines the company to act with circumspection and make some concessions now lest it be shut out entirely, with a great depot on its hands a mile or two from any railroad.

The whole controversy indicates that the terms on which railroads are granted entrances into large cities are apt to be too loose. When street traffic has grown to the proportions common in some parts of every considerable city, it should not under any circumstances be permitted to cross at grade tracks on which locomotives run. There should be some agreement that when the traffic of the railroad (for very frequent trains are more dangerous than frequent vehicles) and the traffic of the street or streets crossing it shall have reached certain proportions, provision shall be made for changing the grade either of the streets or the railroads, at the cost of such parties as shall be determined upon. Our cities grow so fast that it can never be known that any given street or section will not in a few years have traffic on it or crossing it which will make level crossings of a railroad extremely dangerous to both trains and persons in the street. And the traffic of our railroads grows quite as surprisingly, and the road which has two trains a day, for whose passage the whole traffic of a street may be stopped without appreciable loss, in a few years may have fifty or a hundred trains, which form almost a permanent obstacle to all crossing of the tracks at grade.

Iowa is a district for the most part nearly equally distant from Chicago and St. Louis, for whose trade the two cities compete. Before the days of railroads (which was also before the Iowa trade was considerable) St. Louis obtained most of it, the Mississippi River giving it access to the eastern border of the State. But since the construction of railroads connecting the interior of the State with Chicago, the latter city has received by far the largest part of it. St. Louis has all along claimed that all that is necessary to enable it to regain this lost trade and at least equal Chicago in its dealings with Iowa is a system of railroads connecting it with that State. Several such roads have been projected and some have been constructed. Among these is the Central of Iowa, which extends nearly across the State from south to north, and has a pretty direct connection with St. Louis through the St. Louis, Kansas City & Northern Railway. This connection is not quite direct, and the President of the Central of Iowa has been in St. Louis recently to urge the citizens to provide means for extending his road from its present terminus at Albia southward to a junction with the St. Louis, Kansas City & Northern, near the Missouri line. This would make the route 39 miles shorter. The statements made concerning the direction of the traffic of the road up to this time were not the most encouraging for St. Louis, however. It was reported that of 5,500 car loads of freight carried over it, 5,000 went to Chicago and 500 to St. Louis.

The fact is, the chief products of Iowa cannot go to St. Louis on their way to their market without going very much out of their way. The consumers are chiefly in the East, and the direct route to them lies through Chicago, which has the further advantage of cheap lake transportation; which latter decides the course of most of the grain exported. If grain goes to St. Louis, it is then very nearly as far from its final market as when it started.

This by no means proves that the Central of Iowa and similar north-and-south roads are useless, or that it will not be well for St. Louis to provide for the connection from Moulton to Albia. While the bulk of the produce of Iowa is sure to go eastward and not southward, yet the traffic of Iowa with St. Louis, though but a small proportion of the whole, is yet in gross amount large and sure to increase; and though this traffic may not, and, we feel sure, will not support a system of railroads like that which connects Iowa with Chicago and the East, it may still afford a satisfactory business to the Central of Iowa. The fact that the great field for St. Louis enterprise lies south and west of that city does not prevent its having large and advantageous dealings with the country north and northwest of it.

Wooden Railroads are revived periodically and trumpeted as the antidote for the ills of communities suffering for cheap transportation, yet too poor to pay for and support iron roads. They were tried before the days of locomotives, and have been adopted and heralded as a novelty every few years since. In every case, too, so far as we know, when they have been used with locomotives, it has been found necessary either to replace the wooden rails with iron or to abandon their use. A great deal has been said recently of the Quebec & Gosford Railway, and another line in Canada laid with wooden rails. But the result of the operation of these has been unsatisfactory, and, in spite of the great advance in the price of iron recently, it is now intended to lay iron rails on them. There is now a short wooden road in Florida, which was last year operated with steam and this year with horses; but it is represented as a most execrable road. It seems that a road carefully made with wooden rails often works admirably for a short time; after which the rails become battered, with surfaces like oakum which present anything but a smooth track and slight resistance for wheels.

A Uniform Gauge is a thing to be desired, no doubt, but we doubt the possibility and the expediency of securing it by act of Congress; yet this is what Senator Robinson, of South Carolina, proposes to do. He has introduced a bill into the Senate entitled "an act to secure uniformity in the gauge of the railroads of the United States," which requires that one of the terms of the contracts with railroads for carrying mails shall be that by the expiration of one-half of the time for which the contracts shall be made, the roads shall be established on the Northern standard gauge of 4ft. 8½in., under penalty of a reduction of one-fifth of their compensation, with an exception, however, in favor of roads of 3ft. 6in. gauge, or less, which seem to be regarded as peculiarly worthy of forbearance.

This would be a direct discrimination against the railroads of the South, which for the most part have the very convenient gauge of five feet. These now form a system by themselves, reaching as far north as Norfolk in the East (though several North Carolina roads have the Northern gauge) and St. Louis in the West, though the limits of the 5-feet system are generally the Mississippi on the West and the Ohio on the North. West of the Mississippi and south of Missouri the gauges are quite variable, there being at present, we believe, more of 5ft. 6in. than of 5ft., and we think there is (or soon will be) more of the standard gauge of 4ft. 8½in. than of both the others: there are also a few lines in progress of 3-feet gauge. The connections of all the Southern roads with the North grow more and more intimate, and the desirability of running cars, especially freight cars, through between Northern and Southern cities more and more evident; and it seems quite probable that in no very long time the companies will establish a uniform gauge. When this is done it is hardly doubtful which one will be adopted. Not only is the mileage of the roads of standard gauge immensely in excess, but their rolling stock (whose alteration or replacement is the great item in the change of gauge, the cost of moving the rails being comparatively trifling) is much smaller in proportion than their mileage. Economically there is, of course, little to choose between them, though the addition of 3½ inches does give an advantage in the construction of locomotives which we could wish to secure for the standard gauge of America.

The Philadelphia & Reading Railroad Company's refusal to establish a place of registry for its stock in New York, in conformity with the rule of the Stock Exchange, preferring to submit to the penalty—the exclusion of its stock from the Exchange—has provoked considerable comment. The correspondence in the case seems very frank. The company was ready to establish a transfer agency and keep there a statement of the total amount of stock issued, and to give the notice required of any new issue to be made; but it refused to agree to have all its stock certificates countersigned by the New York registrar, and have them dependent on that signature for validity. It found no fault with the Exchange, however, for its action in striking its stock from its list, the President saying: "We have no desire whatever to complain that we are not made an exception to a general rule which is enforced against all other companies."

All this suggests the query: What good is it to the Reading or other company to have its stock called at the Stock Exchange? It may be said that the striking of it off is likely to discourage speculations in it, and that the cessation of speculations is likely to be for the benefit of the company, by confining the holdings chiefly to those who have a permanent interest in them and who will be more anxious to provide for the prosperity of the company for the next ten years than for some maneuvre which may send up shares next week and enable them to sell out at a profit. But there is no question that the calling of shares on the Exchange adds to the value of most of them by making them readily marketable. They thus are made to approach money in availability; and the difference in value between property which can be turned into money at a moment's notice and that which may go begging for a purchaser needs no explanation. It is not likely that Reading shares will be made unsalable by their exclusion from the New York Exchange, however.

Improved stock cars appear to be ignored, or practically forbidden, by an act reported in the House of Representatives by the Committee on Agriculture and passed in that branch of Congress. It provides cattle transported by rail shall not be confined more than 28 consecutive hours in cars, and that between such periods there shall be intervals of at least five hours for rest, food and water. There are two or three inventions which are intended to obviate altogether the necessity for taking cattle from cars either for rest or food, they being planned so that the animals may lie down in their cars, being separated from each other, and provision being made for feeding and watering them on the way. Cars on one of these plans have run through from St. Louis to New York without unloading the cattle, and it is claimed that they were in much better condition than is usual when they reached New York. The terms of the law would seem to impose conditions on the traffic which will render the use of such improved cars, however perfect they may be made, unprofitable; the pecuniary advantage sought by them being the reduction of the time of the trip and the keeping of the animals in good order.

The general law lately passed by the Illinois Legislature authorizing the organization of companies to construct union depots provides that five or more persons or three or more railroad companies may form a corporation for this purpose, whose capital stock shall not exceed $3,000,000, and which shall have power to construct and maintain a union depot in any town where three railroad companies having tracks in that town shall certify that such depot will be useful and that they design to use it. Such companies shall have power to purchase and hold real estate, to condemn lands needed either for the depot or for tracks connecting it with the different railroads, just as railroad companies have, to lay such connecting tracks in or across streets, with consent of the authorities of the place, to borrow money, receive stock subscriptions, etc. The final section requires that no discrimination be made against or in favor of any railroad company which may design to use the depot. Whether under this provision a company with a depot only large enough for three companies will be compelled to admit a fourth and fifth does not appear.

Philadelphia & Reading.

The Governing Committee of the New York Stock Exchange has notified this company to establish a place of registry of stock in New York, else the stock will be stricken from the list called at the Exchange. This is not because of an irregularity in Reading, but because of the general rule of the Exchange, which requires that a place of registry in the city must be kept for all stock "actively dealt in" by the Exchange. Heretofore the dealings have been such that the stock has not been officially classed with those "actively dealt in," but transactions in it have become so frequent and so large that the Governing Committee decides that it must be so considered hereafter. The company has refused to establish an office of registry, and consequently the stock was struck from the list on the 10th.

General Railroad News.

[*Continued from page* 173.]

OLD AND NEW ROADS.

Intercolonial Railway.

The Quebec Board of Trade has voted to petition the Dominion government to fix the gauge of this railroad at 4ft. 8½in., instead of 5ft. 6in., for which it is being prepared. This would make it very desirable for the Grand Trunk to reduce its gauge, which is desirable for many reasons and becomes more and more so as railroads multiply in Canada with the standard American gauge.

London & Port Stanley.

The lease of this railroad to the Great Western of Canada has, it is reported, been consummated. The road extends from the town of London, Ontario, 110 miles from Detroit, nearly due south 24¼ miles to Lake Erie at Port Stanley.

Aid to Railroads in Ontario.

The Ontario Government has passed three orders in council granting further aid to the following railways, viz.: To the Toronto, Grey & Bruce Railway, a sum of $2,250 per mile, between Harrison and Wingham, on condition that the Wellington, Grey & Bruce Company be allowed to run over the same; the Wellington, Grey & Bruce Railway a sum of $2,250 per mile, between Wingham and Kincardine, on condition that it shall allow both the Toronto Company and the London & Huron Railway to use the same; to the Midland Railway a sum of $2,650 per mile, between Orillia and Mundy's (Georgian) Bay, upon condition that it shall allow the Northern Railway to use the same, and the further condition that it shall grant the Grand Junction Railway powers over that portion of the Midland "lying between the point of junction at Omemee or Lindsay, or any intermediate point and Mundy's Bay;" and, lastly, of a sum of $4,000 per mile to the Muskoka Railway, from Washago and Gravenhurst (the portion between Orillia and Washago having already received $4,000 per mile), upon condition that the Midland be allowed to run over the said extension between the junction of the two lines at Atherley and Lake St. John. These grants must very nearly, if not altogether, swallow up the balance of $400,000 voted last session.

Ontario & Quebec.

This proposed line is to run from the city of Toronto through or near Peterborough, Madoc and Carleton Place, to the city of Ottawa, and across the Ottawa River into the Province of Quebec, to effect a junction with railways in that Province, and to unite, amalgamate and make running arrangements with railway lines in the Province of Ontario, situated upon the line authorized to be constructed. The Provisional directors are H. J. Hubertus, H. Abbot, Hon. Jas. Skead, Hon. M. Cameron, Hon. B. Flint, J. M. Currier, M. P.; A. Wright, M. P.; P. M. Grover, M. P.; G. Kempt, M. P.; J. N. Lapum, M. P., and G. D. O'Flynn. The company may be permanently organized so soon as $50,000 of stock is subscribed and ten per cent. thereon paid in. The established distances between the following places is as follows: Toronto to Peterborough, 90 miles; Peterborough to Carleton Place, 126 miles; Carleton Place to Ottawa, 28 miles; total from Toronto to Ottawa, 244 miles. The line proper extends only from Peterborough to Carleton Place, 126 miles.

East River Bridge.

Work has been resumed on the Brooklyn pier, which is now 85 feet above high-water mark, and is to be carried up 189 feet further, of which it is intended to complete 100 feet the current year and the remainder in 1873. The bottom of the caisson on the New York side is 74½ feet below high-water mark and 40 feet below the bed of the river. The excavation has been for 25 feet through sand and gravel and 9 feet through quicksand, and is now in a combination of gravel and quicksand. Only a few feet remains to be excavated before the solid bed of clay and bowlders is reached, on which the pier is to rest finally. It is intended to complete this pier to an elevation of 100 feet this year, and finish the remaining 174 feet in 1873:

The New York *Tribune* gives the following account of the method of removing the sand: "The sand has been excavated by means of compressed air, furnished by twelve steam engines working as many pumps, each being disconnected from the others, so that in case of accident to any one the rest may not be affected. The sand is ejected from the pipes with astonishing force, and eats its way through the heavy iron elbows as though they were rotten wood. Occasionally an elbow gives way unexpectedly, and the sand and small stones shoot into the air to the height of 100 or 150 feet."

Cayuga Lake Railroad.

This railroad is to extend from Cayuga, on the New York Central, southward along the eastern shore of Cayuga Lake to Ithaca, a distance of 40 miles. About one-half of the grading is completed, the iron is secured, and it is intended to have the line ready for trains in October.

Danville, Haselton & Wilkesbarre.

The Pennsylvania Railroad Company has leased this new railroad, extending from Sunbury, Pa., eastward 47 miles, for the term of 33 years.

Montrose Railroad.

A route has been surveyed for a railroad from Tunkhannock, in the county of Wyoming, to Montrose, Susquehanna County, Pa. In length it is a fraction over twenty-seven miles, and the estimated cost of its construction, together with sufficient stock to operate it, is $341,478. The gauge is to be three feet. The contract has been let and the work is progressing.

Washington & Ohio.

The Alexandria *Gazette* says that the President of this company "has finally succeeded in inducing the investment of sufficient capital to push the work on at least to the Shenandoah, with a fair prospect of building it to Winchester, whence there seems no reason to doubt it will be constructed, without further delay, to the Hampshire coal fields, and then on to the Ohio."

Lake Erie & Louisville.

Articles of consolidation of this Indiana company with the Fremont, Lima & Union Railroad Company of Ohio, under the above name, were filed with the Secretary of State of Indiana, April 12. There is to be an election for nine directors, four of whom at least must be residents of Ohio and two of Indiana, May 3. The capital stock is fixed at $4,000,000 in shares of $50.

Canada Southern.

A correspondent writes that track-laying on this road is to be commenced on the 1st of May, and by the 1st of December the road will be open for business from Buffalo to Amherstburg and Toledo, and also the branch to St. Clair—the straightest and most level road in America.

International Bridge.

At the recent annual meeting of the company, Mr. C. S. Gzowski, of the contractors, reported that the structure (across the Niagara River from Buffalo to Fort Erie) will undoubtedly be open for traffic by next December.

Niagara River & New York Air Line.

A meeting of delegates from the towns on the line of the Erie Canal, between Rochester and Lockport, subscribed the stock and organized a company under this name to construct a railroad from Buffalo to a junction with the Lake Ontario Shore Railroad near Rochester. The following gentlemen were elected directors of said company: L. F. Bowen, J. W. Helmer, M. W. Evans, A. S. Brown, B. H. Fletcher, all of Lockport; Henry H. Goff, D. P. Margaw and Isaac Palmer, of Monroe County; J. H. Royce, Wm. H. Watson and E. S. Whalen, of Orleans County.

Western Maryland.

This railroad is now completed as far west as the Antietam and within a mile and a half of Hagerstown, which place, indeed, it was intended to reach by this time.

Union Pacific.

The Government directors have reported to the Secretary of the Interior that, in their opinion, the law fixes the eastern terminus of the road on the Iowa shore of the Missouri, and that any agreement intended to shift the responsibility of maintaining the bridge upon the connecting lines is in "direct and palpable violation of the charter."

The Government directors' opinion is of no further weight than may be given it by the other Government officials in their dealings with the company, which are limited, and probably nothing but the Supreme Court can make a decision by which both parties will abide.

St. Croix & Bayfield.

The long and vigorous fight for the renewal of this company's land grant seems to have ended finally in defeat. The House having voted against the renewal, a favorable vote was obtained in the Senate, and a committee of conference appointed, through which the people interested in the bill were confident of ultimate success. But the committee of conference failed to agree, and, on reporting, the House resolved by a two-thirds vote to adhere to its former action.

Peoria & Springfield.

It is not determined yet whether this road shall pass through Mason City or Middletown. The contract for grading the first ten miles includes the section between Peoria and Pekin and for two miles south of Pekin.

Houston & Texas Central.

Tracklaying has been begun on the extension from Corsicana northward.

Springfield Southern.

Under this name a company has been organized in Springfield, Ill., for the purpose of constructing and operating a railroad from that city to connect with the Decatur & East St. Louis Railroad between the town of Raymond and the town of Litchfield, and also to connect with the Terre Haute, Alton & St. Louis Railroad, between Litchfield and Hilsboro in the county of Montgomery; the said corporation to commence on the 25th day of March, 1872. The following are the names and residences of the first board of directors: John Williams, T. J. Carter, Charles W. Matheny, C. M. Smith, John W. Bunn, Wm. M. Springer, Jacob G. Loose, Isaac Keyes, of Springfield, and John B. Weber, of Penn. The officers are: John Williams, President; C. W. Matheny, Vice President; John W. Bunn, Secretary; Wm. M. Springer, Treasurer.

This is the third company organized within a few weeks to construct a new railroad from Springfield to St. Louis, and there is already an excellent road almost on an air line between the two places.

New York & Oswego Midland.

The Oswego *Advertiser* gives the following summary of the annual report presented by the President, Hon. D. C. Littlejohn, at the annual meeting of this company on the 27th ult.:

"The great Shawankunk Tunnel was completed 3,860 feet in length. The estimated cost of work by the engineer was $371,000. The work had been completed at $5,000 less than the estimate. President Littlejohn stated that the road might be expected to be in running order by the latter part of August next. The New Jersey section will commence running on April 1. The section of forty-seven miles from North Bay to Oswego would probably be used by the Boston & Oswego road, and thereby greatly increased in value. Connections would be made with the Lake Shore road at Oswego, and with the Collingwood line of steamers to Toronto, which would be placed upon the lake soon. The Western Midland would be completed to the Niagara River ere long, opening connection with the Far West. The report speaks of the favorable future promise of the road, of the difficulties overcome and vanquished.

"In addition to this written report, President Littlejohn explained more fully the working of the New Jersey section. The work had been delayed because of the interference of Erie. The Erie road had from the first opposed the construction of the Midland, and did all in its power to defeat it. For six months the Midland Company had been at law over crossing the track of the Erie. That crossing has now been effected, and trains would begin running on the 1st of April. The work of grading was rapidly going on in the unfinished section of the work. Three vessel loads of Welch railroad iron was on the ocean, coming to us, and would be used on these sections. The road gave promise in time of handsome dividends."

Atlanta to Jacksonville.

Cars are now running through between Atlanta, Ga., and Jacksonville, Fla., running over the Macon & Western Railroad from Atlanta to Macon, the Macon & Brunswick from Macon to Jesup (the junction with the Atlantic & Gulf), the Atlantic & Gulf thence to Live Oak, and the Jacksonville, Pensacola & Mobile from Live Oak to Jacksonville. This is not a very direct route, but it is as short as exists at present, and avoids a great number of changes which heretofore have been unescapable and have made the journey quite unpleasant. This greatly improves the route from Louisville, St. Louis, Chicago, and the Northwest to Florida.

St. Louis, Jerseyville & Springfield.

A charter has been granted to a company of this name under the Illinois general railroad law for the building of a railroad from Springfield, by the coal-fields near Chesterfield, Macoupin County, to Jerseyville, thence to Grafton, on the Mississippi River, and from there by way of St. Charles, Mo., to St. Louis. It is not very different from the route of the Springfield, Carrollton & St. Louis Company.

The first board of directors are Hon. Orlin H. Miner, Hon. William M. Springer, Hon. Anthony L. Knapp and Charles W. Matheny, Springfield; Hon. Hugh N. Cross, Clarence M. Hamilton, Hon. Robert A. King, Wallace Leigh, James A. Locke, Milton D. Robbins, Hon. Henry O. Goodrich and Col. William H. Fulkerson, Jerseyville; Henry E. Dougharty and William McAdams, Sr., of Otterville, and Hon. William H. Allen, of Grafton, Ill. The principal office is at Grafton.

Municipal Aid in Wisconsin.

The Wisconsin Legislature recently passed a bill regulating municipal aid to railroads, which authorizes counties, cities, villages and towns to issue bonds in aid of railroads on vote of a majority, to an amount not exceeding, with other debts, 10 per cent. of the assessed valuation of property; no county to issue bonds except on the vote of both a majority of the voters and of election precincts, nor to an amount which would make the debt of a subdivision, together with its share of the county debt incurred, over 10 per cent. of the assessed valuation. It also authorizes municipalities to subscribe for stock, to be paid for in three annual installments, under like restrictions as in issuing bonds—the last installment not to be paid till the road is completed through the place voting aid. It would appear, therefore, that the incurring of a debt equal to 10 per cent. of its assessed valuation by any town of a county will effectually prevent any vote of aid by the county.

Cairo & Fulton.

This company is offering $8,000,000 of first-mortgage, sinking-fund, 7 per cent. gold bonds, at 87½. As the line is 301 miles long, this is at the rate of about $26,500 per mile of road. The announcement says that the road in its entire length deviates from a straight line but six miles, that 60 miles are completed, that the entire road is under contract, and that track will be laid at the rate of half a mile a day until the road is completed. The land grant on which, as well as on the road and rolling stock, these bonds are a lien is nearly 2,000,000 acres.

We believe that the route of the road north of Little Rock has few obstacles to construction, except such as numerous not very large streams present; but south of Little Rock there is some difficult ground to cross. The country on the line is thinly peopled and not growing very fast; but much of the land is fertile, and this State and Texas offer almost the only considerable area of cheap new land in the South, and are likely, therefore, to receive the bulk of the emigration from the older Southern States. But this line has the remarkable advantage that it is at present the only railroad line extending from Arkansas northward in the entire State, and, for a time at least, is likely to have traffic from each side of its line for 50 or 60 miles, without competition. It will also be the shortest line from Texas to St. Louis, Chicago, and probably to Cincinnati, and to the country north of those places, and, if a connection is made with the International—that is, if some other outlet is not built especially for the International—will be the shortest route for shipment of Texas cattle.

Burlington & North Pacific.

Officers of this company report that they have let the contract for the construction of their road from Grinnell to Montezuma, Iowa, by July, and from Grinnell to State Center by December, and that the iron is purchased for the track from Grinnell to Montezuma. They also report that the Chicago, Burlington & Quincy Company, and also the Toledo, Peoria & Warsaw, backed by the Pennsylvania, have offered to iron, equip and operate the road on a lease.

Delaware, Lackawanna & Western.

The company's car works at East Dover, N. J., on the Morris & Essex road, were entirely destroyed by fire on the night of the 3d instant, together with three new passenger cars and several freight cars, and a large stock of tools and materials, the whole valued at about $100,000. It is reported that they may be rebuilt at Port Morris.

Municipal Subscriptions in Illinois.

The act to legalize the transfer of subscriptions of municipalities in aid of railroads, made before the new constitution, from one corporation to another, has been defeated in the Illinois Senate.

Shenandoah Valley Railroad.

The Winchester (Va.) *News* says that this company has parties at work at grading at several points in Clarke County, and that there is again faith that the road will be built.

Alexandria & Fredericksburg.

The first depot building has been erected at a point to be known as Long Branch Station. The bridge over the Occoquan is nearly completed, and trains will soon be crossing it.

Valley Railroad.

The Staunton (Va.) *Spectator* says work on the Valley Railroad, between Harrisonburg and Staunton, is about to be commenced. Two sections have been let to contractors, the ninth and the twenty-sixth, the former to Mr. P. M. McCabe, of Maryland, and the latter to Messrs. Kelly & O'Connor. Of this firm the former is the well-known contractor who owned the Sweet Chalybeate Springs, in Allegheny County, and the latter is a citizen of Staunton. The sections on this road are numbered from Harrisonburg, so that the twenty-sixth section is the last, counting from Harrisonburg.

Evansville, Henderson & Nashville.

The lessees of this road ask the right of way through Henderson for a track which will enable it to run its cars to the bank of the Ohio, and Henderson is willing, provided the shops of the road are established there. There is a charter for a bridge at Henderson, and the town has the privilege of voting $200,000 to help build it.

Bowling Green & Madisonville.

This company has been organized in Kentucky recently to construct a railroad from Madisonville, on the Evansville, Henderson & Nashville road and at the southeastern terminus of the proposed Shawneetown & Madisonville road, southeastward 60 miles to Bowling Green. It is hoped that a road will be made from Bowling Green southeast to Knoxville, which would complete a short line from St. Louis to the latter place, the western part of which, at least, would be controlled by the St. Louis & Southeastern Company.

Columbus & Hocking Valley.

This railroad extends from Columbus, Ohio, southeast to Athens, 76 miles, with a branch from Logan (50 miles from Columbus) eastward to New Straitsville, 12 miles. Its chief business is the transportation of coal from the Hocking Valley mines. The report for 1871 says that in that year a large coal traffic was begun to points on the lakes, through shipments by way of Cleveland, and the Cleveland, Columbus, Cincinnati & Indianapolis Company are having a large stock of cars constructed especially for this trade.

A mortgage for $1,000,000 has been authorized to pay off the floating debt, and $250,000 of the bonds have been sold to provide additional equipment.

The statement of income and expenses in operating the road for the three years ending December 31, 1871, is as follows:

1869, with road open about forty miles—

Gross earnings	$150,229 73
Gross expenses	77,058 96
Net earnings	$73,170 77

Ratio of expenses to earnings, 51 30-100 per cent.

1870, with road open sixty-two miles—

Gross earnings	$372,229 41
Gross expenses	161,314 59
Net earnings	$210,914 82

Ratio of expenses and earnings, 43¼ per cent.

1871, road opened through—

Gross earnings	$548,943 41
Gross expenses	263,209 41
Net earnings	$285,733 00

Ratio of expenses to earnings, 47 95-100 per cent.

Lake Shore and Michigan Southern.

This company's "Elevator B," at Toledo, was burned on the evening of the 13th, together with 160,000 bushels of corn, 12,000 bushels of oats and 8,000 bushels of wheat. The loss is estimated at about $100,000, which the insurance covers.

Canada Southern & Chicago.

Some misstatements have been made recently concerning the officers of this company. The Chicago members of the directory are George Goss, F. H. May and Chester Warren. George C. Campbell is the attorney of the company in Chicago, but not a director. From Detroit River westward 92 miles it is on an air line. The grades are not more than 15 feet to the mile in either direction. A single track of steel rails is to be laid first, and as soon as it is completed a second track is to be laid.

Lafayette, Coal Creek & St. Louis.

This company filed articles of association at Indianapolis on the 6th inst. Its purpose is to build a road from Lafayette, Ind., southwest to Paris, Ill., a distance of 56 miles, where it will connect with the Indianapolis & St. Louis road. Directors: W. J. Quigley, John L. Miller, J. S. Williams, Fred. Geiger, David Mehorry, Alexander Mehorry, Samuel Carter, C. J. Brown, J. I. Jones, J. M. Cone, P. D. Hammond and Mark Jones; $39,000 of the capital stock is subscribed—the total amount is $1,000,000.

Chicago & Rock River.

It is reported that the earnings of the completed section of 20 miles of this road, from Rock Falls to Amboy, but lately opened, during the month of February, were sufficient to cover operating expenses and the interest on the bonded debt. The company is prosecuting the extension eastward and has bought a tier of lots across Amboy, and has completed all the bridges and culverts for five miles out of that place.

Litchfield Car Manufacturing Company.

This company, recently organized in Illinois, received from the town of Litchfield a bonus of $15,000 and a lease for 15 years of the shops recently vacated by the Indianapolis & St. Louis Company. It expects to be ready to begin work in May, and, it is reported, has already received considerable orders. E. R. Stiles is President; H. H. Beach, Vice-President; W. E. Bacon, Secretary and Treasurer, and M. M. Martin, General Superintendent.

Toledo, Peoria & Warsaw.

This company is offering its second-mortgage bonds, bearing 7 per cent. interest, to the amount of $100,000. The earnings of this road have not been very large, but they have increased greatly the present season.

Milwaukee & Northern.

Work is progressing on this line north of Plymouth, Wis.

Manitowoc, Appleton & New London.

A large force is at work on the uncompleted section east of Appleton. It is to be completed in June.

Wisconsin Midland.

Surveyors have been examining a route for this road, known in Wisconsin as the "Esterly road," through Fort Atkinson, Whitewater, East Troy and Rochester. Fort Atkinson has voted in favor of a subscription to this company, and two small townships have voted against subscriptions.

Winona & St. Paul.

The route which the Chicago & Northwestern has had surveyed extends from the Winona & St. Peter Railroad six miles above Winona, through Farm Hill, Olmstead County, Mazeppa, Zumbrota, Hader, Cannon Falls, and Empire City to St. Paul, the distance from St. Paul to Winona being 104 miles, a mile further than by the St. Paul & Chicago road.

The St. Paul *Pioneer* says of this route: "The route surveyed is a most favorable one, not only for building the road, but also for business. It runs through the best farming portion of the State, already thickly settled and under a high state of cultivation. It also strikes an immense amount of water power, where already are located some of the largest and best flouring mills in Minnesota. The water powers on the two branches of the Zumbro, the two branches of the Cannon and Vermillion rivers, are among the best in the Northwest, and are capable of an almost unlimited amount of improvements. The products of these mills alone will furnish an immense amount of business for the road."

Kansas City, Brookfield & Chicago.

This is the name of a company which proposes to construct a railroad from Kansas City northeast on a very direct line to Keokuk, Iowa, where connection is to be made with some road across Illinois to Chicago.

Dakota Southern.

The contractors who are constructing this railroad from Sioux City westward to Yankton, 65 miles, are the Chicago firm of Wicker, Meckling & Co., consisting of Messrs. Charles G. Wicker, Joel H. Wicker, J. S. Meckling and M. Weston.

Sioux City & St. Paul.

The grading of the uncompleted section of this road, from Okabena Lake, Minn., southeast to Le Mars, Iowa, 70 miles, is completed, and tracklaying is to be begun directly. It is expected to have it in working order throughout by October.

Maine Central Consolidated Loan.

The stockholders of the Somerset & Kennebec and Portland & Kennebec Railroads met at Portland on the 26th ult., and voted to accept the Maine Central loan act passed by the last Legislature and to join the Maine Central in a joint mortgage. Other roads are yet to accept the provisions of the act.

Vermont Central Rolling Mill.

After the Vermont Central leased the London Northern road, it was proposed to construct a great rolling mill at New London, particularly, as it appeared, to roll iron for the Vermont Central system. But New London not being sufficiently enthusiastic in the matter of subscriptions, St. Albans, Vt., has taken it up and its people have taken $210,000 stock, and the mill is to be in operation this next fall.

Walla Walla & Wallula.

Work has been resumed on this Oregon railroad.

Fort Wayne, Jackson & Saginaw.

From the annual report for 1871 it appears that the receipts of the company that year were:

Freight	$112,349 98
Passengers	84,917 35
Mails and other resources	23,243 66
Total	$220,510 99

This was an increase over the total earnings of the year 1870 and prior, of $118,802.34. The increase in the receipts for passengers was $36,161.93; for freight, $67,316.38: other sources, $15,324.04. The receipts were at the rate of $2,205 per mile. The President calls attention to the combination made with the Fort Wayne, Muncie & Cincinnati road for an interchange of traffic, and with the Detroit, Hillsdale & Indiana and Detroit, Eel River & Illinois for their use of the 46 miles of the Fort Wayne & Jackson track, which separates these roads. The latter contract can be terminated at six months notice by either party.

There are at present on the road eight engines, four first-class passenger coaches, one second-class coach, two baggage, mail and express cars, three caboose cars, eighty-three box cars and one hundred flat cars. One more engine (probably two), one baggage, mail and express car, two freight cabooses, a few box cars, and a small number of stock cars will be needed during the coming year, in addition to those now on the road.

North Shore Railway of Canada.

This important road, extending through the thickly-populated towns and counties on the north shore of the St. Lawrence River, between Montreal and Quebec, a distance of one hundred and sixty miles, has recently been placed under contract to Messrs. Samuel L. Keith & Co., of Chicago, and is to be constructed immediately. The contract also includes the "Piles Branch" of thirty miles, extending from the city of Three Rivers, a point midway between Montreal and Quebec, through the immense deposits of iron ore, which are considered very valuable, to the Great Falls of the St. Maurice River, from which point the river is navigable a distance of about one hundred miles, penetrating into the vast pine and other valuable timber and iron regions of the upper St. Maurice. The company has a subscription of one million dollars from the city of Quebec, and a quarter of a million from the counties along the line. It also has a grant of two million acres of valuable pine timber lands from the Canadian Government, which are estimated to be worth much more than the entire cost of the road.

Connecting as it does with the head of deep ocean navigation at Quebec, this road, it is believed by its promoters, is destined to become the Eastern link in the Canada Pacific, as well as of the Canada branch of the Northern Pacific Railroad.

Missouri, Kansas & Texas.

This company's line in the Indian Territory is now completed for 38 miles south of the Arkansas and nearly to the North Fork of the Canadian.

Leavenworth, Oskaloosa & Topeka.

Leavenworth, by an overwhelming majority, has voted to subscribe $150,000 in aid of this proposed railroad, for which Jefferson County has voted $125,000 and Shawnee County $150,000. It is reported that these subscriptions insure the construction of the road.

Central Pacific.

This company's San Joaquin Valley Branch was completed last week to the bank of the San Joaquin River, a distance of 107 miles from its junction with the main line at Lathrop.

Oregon & California.

The Oregon *Sentinel* of March 16 says that the iron for the track between Creswell and Oakland, Oregon, was being forwarded rapidly, and would be laid as soon as the weather permits. When this is done the road will be in running order one hundred and eighty miles from Portland.

Union Pacific.

Since the last election this has been called a "Vanderbilt" company, two or three of Commodore Vanderbilt's sons-in-law having the leading offices. But the speculators have taken it for granted that the Commodore had a large interest in it personally, and they have a good deal of confidence that whatever stocks he puts his money in are not going to fall in price permanently. Therefore his name has been used pretty freely to "bull" the stock. The New York *Herald* having given currency to this common report, the Commodore sent to it last week the following disclaimer:

"In your editorial columns of this day you associate, in a complimentary manner, my name with the recent change in the direction of the Union Pacific Railroad Company. While I fully appreciate the honor you intended to confer, justice compels me to state that I am not, and have never been, in any way, directly or indirectly, connected with any of the Pacific railroad enterprises."

Thereupon the stock fell about a dollar per share, but it has recovered since.

Southern Pacific of California.

The Vallejo *Chronicle* of March 29 has the following: "L. H. Shortt, Chief Engineer of the California Pacific Railroad Company, left Sacramento on Wednesday with three car-loads of outfit, to superintend the surveying of the route of the Southern Pacific Railroad from Tehachape to the Colorado, near Fort Mohave. He will have a corps of seventeen men, and will probably be about six months in completing the work. As the country is comparatively unknown, they take with them everything that prudence suggests may be necessary."

Jacksonville, Pensacola & Mobile.

An adjustment of the difficulty that has put this road into the hands of a receiver is talked of. Gen. Littlefield, it is reported, may retire from the presidency of the company and a lease made to responsible men who will construct the extension west of Chattahoochee and secure the payment of the $471,650 of outstanding first mortgage bonds, for which the Trustees of Improvement Fund of the State have seized the road.

Mobile & Northwestern.

The Jackson *Pilot*, of recent date, has the following concerning this road:

"At the Mobile end of the route, 17 miles are nearly graded and the rolling stock is already there ready for use. The iron is on shipboard, and will be received at Mobile in a few days. At the Helena terminus, 25 miles have been graded and prepared for the ties. The iron for this portion of the road, with one locomotive, is *en route* from the East. The whole length of the road is 350 miles, and with contemplated branches added, it will number 500 miles, 50 of which will be completed by the 1st of June—30 of which will be in this State and 20 in Alabama. As soon as the line of road is permanently fixed at its crossing with the New Orleans, Jackson & Great Northern road, the work will begin at that place, working both ways, so that with the parties at each end, construction will be pushed forward from four distinct and separate portions of the road."

Tennessee Railroads.

The State of Tennessee has sold its interest in the Knoxville & Charleston Railroad to Steers & Patterson for $105,000, and its interest in the Rogersville & Jefferson Railroad for $23,000 to Captain Jaques, of the East Tennessee, Virginia & Georgia Railroad.

Memphis & Little Rock.

It is now reported that there has been for some months an agreement for the lease of this road to the Southern Security Company; and the recent failure to close the contract is said to be due to dissatisfaction of the Security Company with the terms of the consolidation with the Little Rock & Fort Smith road.